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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

No. 56

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GENERAL

MAIN DIRECTIONS OF DEVELOPMENT IN COMPUTER INDUSTRY REVIEWED

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 81 pp 3-6

[Lead article: "Put the Decisions of the 26th CPSU Congress into Effect!"]

[Text] The 26th CPSU Congress, which was held from 23 February until 3 March of 1981, was an event of world historical importance. It becomes more obvious each day that the decisions of the highest forum of Soviet communists had an enormous effect on the minds of hundreds of millions of people in the world and provided a powerful impetus in the struggle of the progressive forces of the world for peace, social progress, and socialism.

The congress outlined the goals of the 11th Five-Year Plan and the prospects for the coming decade, opening a new phase in the constructive work of the Soviet people, a phase that will in large part predetermine the face of our country on the threshold of the Third Millenium.

A sharp increase in production efficiency is the key economic and political challenge of the current phase of building communism. The essence of this challenge is to make fuller use of the capabilities of mature socialism and its enormous production potential, substantiate closer integration of science and production, and improve techniques of economic management.

The conditions of national economic development in our country in the 1980's make it even more urgent to accelerate scientific-technical progress. The CPSU bases its thinking on the proposition that a new society simply cannot be built without science. As the Accountability Report of the CPSU Central Committee to the 26th congress stated, the country desperately needs major scientific efforts to be more concentrated on solving key national economic problems and making discoveries capable of bringing about truly revolutionary changes in production, in addition to continued work on theoretical problems.

Computer technology has a very important part in meeting the historical challenges outlined by the 26th CPSU Congress. The building and efficient use of computer technology in the national economy has been and remains one of the principal directions of the modern scientific-technical revolution. The party has always given this sector of science and production a great deal of attention. Suffice it to say that while the production of machine building output in our country rose 2.7 times in 1970-1980 and the production of instruments increased 3.3 times, the production of computer technology during these years increased 10 times.

The quality of computer technology has risen also. Thanks to unquestioned advances in the technology of manufacturing integrated circuits and the use of progressive architectural and structural concepts, we have organized mass production of general-purpose and control computer and peripheral units which are fully comparable to the best foreign models in terms of basic parameters (speed and reliability). Attempts by the United States and other capitalist countries to retard progress in our country by means of an embargo have only led us to establish our own highly skilled electronics machine building sector and equip the appropriate enterprises with cathode ray and optical lithography with high resolution, measured in fractions of a micron, and with laser and ion-plasma equipment.

The Soviet electronics industry today produces up-to-date superlarge and superfast integrated circuits that contain hundreds of thousands of transistors interlinked into intricate electronic devices. Mass production of microprocessors has created unlimited opportunities for automating machine tools, machines, apparatus, complex industrial processes, scientific research and experimental design work, and domestic appliances. The continuing reduction in cost of microprocessor devices and increase in their "intellectual" capacity, specifically for such operations as recognition of visual and sound images, will permit a major advance in the area of work engineering and in the foreseeable future permit a solution to one of the most important social problems: the elimination of heavy physical labor and a sharp reduction in the list of "low-prestige" occupations.

In solving the problems of putting microcomputers to work it is more important than ever before to follow the comprehensive approach which realizes the slogan: "Pure research today, the foundations of technical policy in the sector tomorrow." The usefulness of this approach was demonstrated by preparations for large-scale use of computers in the communications equipment industry. The program for these preparations envisions the following work:

a. identifying the spheres of application of microprocessor equipment;

b. training specialists in the use of microprocessor equipment;

c. conducting scientific research and experimental design work to formulate a modular set of such equipment;

d. preparation for production of such equipment in large series;

e. development of instruments and systems using microcontrollers and microcomputers;

f. setting up a center for users of microprocessor equipment.

There is every reason to expect that this careful and comprehensive preparation for computerization of the communications equipment industry as outlined for the 11th Five-Year Plan will make it possible to achieve truly revolutionary changes in this sector, which is extremely important to the entire national economy.

In the 11th Five-Year Plan the developers of computer technology must also solve the very important problem of building general-purpose high-speed computers with speeds on the order of hundreds of millions of operations a second. Results obtained in the past five-year plan from pure research demonstrate that this problem can be solved only with a completely new, untraditional approach to organization of the computing process, a new ideology of macrosystem computation that makes it possible to join together problems of any dimensionality and an unlimited number of processors. The new ideology has been made the foundation for development of the senior models of the next phase of the Unified System of Computers (Ryad-3) and will require, needless to say, additional research in the fields of programming and training of appropriate programming cadres (the process of programmer thinking changes fundamentally in preparing programs for these computers).

The development of systemwide and applied programs should become increasingly similar in style to an industrial process with maximum automation of all phases of formulating the program: development of the algorithm, writing the program, optimization, documentation, tracking, and if necessary correcting the program throughout its entire life. This task can only be accomplished on the basis of continued and far-reaching research in the fields of programming theory and general-purpose and specialized program logic. The ideas of step-by-step program design, formalized technical specifications, and standardization must be introduced in practical development of program systems.

The developers of general software for contemporary minicomputers and microcomputers face special challenges. The limited stocks of such machines and the possibility of large-scale production of identical sets of programs demand that the programs be written and debugged especially well. The development of highly efficient cross-systems for production of programs is a complex and expensive business. Because a significant share of such systems (more than 90 percent) can be made independent of the system of commands and other characteristics of a special-purpose minicomputer or microcomputer, the problem arises of automated adaptation of the machine-dependent part of cross-systems for programming and debugging them for any system of commands for small computers.

The problems of developing program systems of machine graphics are becoming more and more complex and diverse, but without solving them further advances in the automation of designing and in automation of scientific research would be inconceivable. The most pressing problems are development of graphic languages, standard graphic protocols, and systems for control of graphic data bases that are substantially more concise than existing ones and correspond to human spatial thinking.

The main direction of further development of applied programming in the current five-year plan will be raising the intellectual level of packages, which should take on more and more functions related to analysis of the conditions of complex computing and scientific-technical problems and synthesis of algorithms that insure efficient solutions to these problems.

Among the most promising directions of use of computer technology outlined by the 26th CPSU Congress for the 11th Five-Year Plan and the period until 1990, special note should be made of systems for automating scientific research and systems for automating design work.

Whereas in the past the principal effort in setting up automated systems for scientific research has been chiefly to automate the collection and processing of experimental data, the main objective now is to establish automated problem-oriented laboratories where computer technology will take over control of the experiment as a whole. Future automated systems for scientific research will be based on large information-measurement complexes working in real time and will be used to investigate more complex scientific problems and work out technical concepts that determine the development of our power industry, nuclear physics, communications, space research, means of transportation, and the like for the near future.

In general the equipment used for such research is unique, and the experiments run on it are exceptionally expensive and not always reproducible. This imposes very high requirements for the reliability of the computers and other equipment, for the speed of these complexes (according to forecasts, the speed of the most powerful measurement-computing complexes should reach $5 \cdot 10^8$ operations per second by the end of the 1980's), and for the reliability of the corresponding software.

Equally high requirements are imposed for systems to automate design work. We need only add that further advances in the development of systems to automate design work are inconceivable without comprehensive large-scale training of future specialists to work under the new conditions. One of our important and urgent jobs is to equip the appropriate higher educational institutions and schools with the necessary hardware to train students.

The 26th CPSU Congress devoted considerable attention to the problem of further raising the efficiency of use of computer capacities by setting up collective-use computer centers and networks of computers. An analysis of report data for 1980 and the 10th Five-Year Plan as a whole showed great unevenness in the use of computers in different ministries and departments. Many of them use computer capacities to solve a limited range of problems, which leads to dispersal of computer equipment and highly skilled employees and inadequate loading of computers, at the same time as the needs of other ministries and departments for computing work are not being met.

The formation of collective-use computing systems and networks of computers as the foundation of the future nationwide automated system for collection and processing of data for accounting, planning, and management of the national economy is the only possible way to raise the efficiency of use of computer equipment. It makes it possible to resolve major economic planning, engineering-technical, and scientific problems with raw data that is spread out at many different computer centers remote from one another in a region or in the country.

A great deal must still be done to realize this possibility. Specifically, we must complete work on setting up the nationwide data transmission network, standardize protocols for controlling information in the network, and solve the set of technical and organizational problems associated with the use of information distributed in the network.

The most important problems whose solutions will become possible with a highly developed network of collective-use computer centers and computers will be economic planning problems, above all the problem of compiling balanced national economic plans. The technology necessary for such planning has already been developed and is known by the name "Displan." It presupposes the possibility of direct access by planning agencies of different levels all the way to USSR Gosplan to the information bases of the sectors, industrial associations, and individual enterprises. The hundreds of millions of norms existing at enterprises and planning organizations will flow to republic and nationwide planning bodies while gradually being averaged (aggregated). They will form the basis for compiling a dynamic, balanced model of the country's national economy that makes it possible to write an optimal and precisely balanced national economic plan.

The chief advantage of such plans will be that they not only completely preclude any undesirable subjective influences (for example, attempts to conceal existing reserves) but also offer the possibility of operational correction of the plans related to major changes in production technology, launching of new enterprises, changes in extraction of raw materials, and the like.

The key challenges given to the collectives of developers of computer equipment and automated control systems can only be met if scientific and planning-design subjects are correctly assigned to them, with effective coordination of work to carry out these projects. The USSR Academy of Sciences' Coordinating Committee for Computer Technology, which was formed in 1978, and the working groups of the Commission on Multilateral Cooperation of the Academies of Sciences of the socialist countries for the problem "Scientific Questions of Computer Technology" are expected to play a definite part here.

It is also necessary to intensify work to supply scientific research and planning-design organizations with skilled systems analysts and programmers. This requires constant monitoring of the curricula of higher educational institutions in the corresponding specializations and coordination of the assignment of young specialists.

Even a short list of the key challenges set down by the 26th CPSU Congress with respect to building and using computer technology shows convincingly what a significant role they play in the contemporary scientific-technical revolution. It is a matter of honor for every Soviet citizen who is to any extent involved with meeting these challenges to do everything possible to see that they are fully met.

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CSO: 1863/174

DIRECTOR OF KIEV CYBERNETICS INSTITUTE DISCUSSES DEVELOPMENTS

Moscow PRAVDA in Russian 11 Mar 81 p 2

[Interview with the director of the Ukrainian SSR Academy of Sciences Institute of Cybernetics academician V.M. Glushkov, in Kiev, by PRAVDA correspondent M. Odintsev: "It Helps Discoveries." Date not given]

[Excerpts] In five years the scientists at the institute have completed 185 pieces of research work and 241 economic agreements. On the whole, the volume of research work has grown considerably compared with the 9th Five-Year Plan, and substantial and qualitative shifts have been made. The transfer is consistently being made to the program-dedicated methods of organizing and controlling research and development, and the return from them is increasing. Take the following figures. During the five-year plan the national economic savings from introducing the results of our work has amounted to more than R460 million. Each ruble of input has yielded R6.85. As you can see, the results are not bad. While constantly engaging in basic research, our colleagues at the same time devote much effort to practical application of their results in the national economy. Things introduced include automated systems for the control, planning and processing of results from research and scientific experiments, specialized software-and-hardware packages and basic means for microprocessor technology.

The practice of concluding agreements with enterprises that utilize our research results is being constantly expanded. Discussion on progress in fulfilling pledges has been useful at joint meetings of the party committees of the Institute of Cybernetics and the Zhdanov Metallurgical Plant, the Kiev Industrial Association imeni Korolev and the Kievpromstroy Combine, and also at meetings between the local committees of the institute and the Kiyanka factory.

Work done during 1980 included an outline project for a highly productive computer based on fundamentally new scientific and technical decisions. Effective means of cybernetics technology that have been applied in various sectors of the national economy were developed jointly with organizations of the ministries of the electronics industry and the communications equipment industry and put into series production. Comprehensive research on and practical applications for setting up structurally complex universal data banks and data systems for various applications were completed ahead of schedule. Work was completed on the development of the first stage of a republic automated system whose distinguishing feature is the comprehensive coverage of all control links. The national economic savings from its introduction are more than R280 million.

9642
CSO: 1863/152

DUPLICATION OF EFFORT CRITICIZED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 1 Apr 81 p 2

[Article by G. Kushnir, first secretary of the Frunzenskiy Rayon Committee of the Communist Party of Moldavia, Kishinev: "Their Own and Our Own"]

[Excerpts] Two scientific research institutes established computer centers for themselves. One acquired the modern YeS-1033 computer for 650,000 rubles. The other did too. One hired a staff of programmers, mathematicians, economists and electronic technicians. So did the other. Both institutes opened these computer centers almost at the same time. And they began operating. At one center, 25 percent of capacity was utilized; at the other, the equipment was considerably underloaded. And what was all the more striking was that both computers were located in one place--only a partition separated them.

Everything is clear, the reader will say; the author will now invariably stress that this is not simply a partition, but a departmental barrier.

The Scientific Research Institute for Planning and the Institute of Scientific and Technical Information in question belong to the same department--the republic's State Planning Committee.

I will immediately allow myself to cite a second example.

One of the strongest project design organizations in the rayon developed a very advanced automated system for management of housing that promised to substantially reduce expenses for running these complex facilities. The advantages of the system were evident. However, the Ministry of Housing and Municipal Services for the republic flatly refused to introduce it, pointing out that a similar system is being developed in the sector computing center. Two years went by. One day, we invited the managers of the rayon production administration for housing to a bureau session and asked them how the process of housing operations could be improved. It turned out that in essence they had nothing to say. And the system? Our own system, it was explained to us, had not yet been developed, but all the same there was no need of someone else's .... That was their position.

In the end, things got moving and now "someone else's" system is being successfully introduced for the rayon housing facilities. But this happened only after a serious talk with the administration managers at the bureau session. By the way, in the first story I told, changes have been noted. The first steps have been taken to unite the computer centers. They were taken, I stress, after intervention by the managers of the republic's State Planning Committee.

Why does the interest of some managers not extend further than the plant or factory entrance to "one's own" plant or "one's own" factory? You see, this is indeed a real failure in party committee work.

8545
CSO: 1863/163

CAPABILITIES OF COMPUTER TECHNOLOGY DISCUSSED

Minsk SOVETSKAYA BELORUSSIYA in Russian 26 Apr 81 p 2

[Article by Doctor of Economic Sciences L. Il'yev]

[Text] One of the most important trends of improving economic management is extensive use of modern computer equipment. The state of using computers and ASU [Automated control system] in the republic's national economy was seriously criticized in the annual report at the 29th BCP [Belorussian Communist Party] Congress. The problem of combining existing ASU and computer centers into a unified republic information gathering and processing system and of developing collective-use computer centers was posed.

Raising this question follows objectively from the party-posed task of further development and an increase of the efficiency of automated control systems and computer centers. The main trends provide for "improvement of computer equipment, of its component base and software, of information transmission and processing devices and systems and for increasing the efficiency of automated control systems."

A collective-use computer center (VTsKP) is the main technical link in the state computer network of industrial enterprises with regard to territorial and sector affiliation.

Intensive development of data processing and transmission devices of different nature to solve scientific, production, management, planning, information and many other tasks becomes a good technical base for the information-computer networks being developed in our country, which in turn significantly increase the coefficient of automation of information processing and circulation in all sectors of the national economy. Modern information processing and transmission hardware will also contribute to effective introduction of new scientific methods of management and national economic planning into the practice of economic management.

Moreover, time dictates the need to convert to more improved forms of collective servicing of computers in which the equipment is used on a centralized basis. The basis for realizing the given format should be collective-use computer centers.

More than 300 ASU and 148 computer centers at which 33,500 highly qualified specialists are involved are now functioning in Belorussia. More than 50 large computer centers servicing individual enterprises, organizations and agencies have been put into operation in Gomel' and Gomel'skaya Oblast. The nature of computer use and the degree of their loading cannot be recognized as satisfactory. Computer equipment is frequently used as a high-speed adding machine that performs the simplest operations. Solving the problem of optimization of production, control of production processes, forecasting socioeconomic development, planning and operational monitoring of the course of production is given very low specific weight. Thus, for example, the specific weight of the range of engineering and technical problems and problems on production control at the VTs of the Chemical Plant imeni 50-letiya SSSR, according to data for the second 6 months of 1980, comprises only 3.3 percent. The volume of work on preparation of production and performing scientific, engineering and technical and planning-design calculations on the Minsk-32 and YeS-1022 computers comprises 8.8 percent at the Production Association Belarus'kabel' and 5.6 percent at the computer center of the BSSR Minpromstroy [Ministry of the Construction Industry]. These types of work are generally not performed at the computer centers of the Rail Car Repair Yard imeni Kalinin and the Production Association Gidroavtomatika. Modern expensive equipment is used mainly for accounting-statistical and planning-normative work, economic information processing and so on. This work is of course also necessary but the capabilities of modern computer equipment are considerably broader and the greatest effect can be achieved when solving optimization problems of production control, engineering-design and other types of planning work.

Can it be recognized as satisfactory when the load of computer equipment comprises half the possible load and when the planned fund of computer operating time is utilized by 64 percent?

The following fact should also be noted. Computer centers usually have identical functional subdivisions for algorithmization and programming, technical servicing of computers and so on. Parallelism and duplication of work frequently lead to the fact that the "bicycle is invented" every time with respect to an enterprise or agency. The agency approach also makes it difficult to coordinate work and to exchange information. Development of collective-use computer centers based on existing VTs will make it possible to eliminate the named and many other existing deficiencies. It should be noted that there is an objective basis for solving the problem of VTsKP development at Gomel', for example. There is a number of institutions in the city which can render effective assistance in this matter. These are higher academic institutions and specialized laboratories of agencies, institutions and enterprises. Specific interest, attention and persistence on the part of interested organizations and agencies should be shown in this.

6521
CSO: 1863/169

EAST GERMAN COMPUTER TECHNOLOGY REVIEWED

Minsk SOVETSKAYA BELORUSSIYA in Russian 21 Apr 81 p 3

[Text] Taking on a shock labor watch in honor of the 10th SEPG [Socialist Unity Party of Germany] Congress, the collective of the foreign trade enterprise of the GDR Robotron Export-Import has adopted the pledge to manufacture the YeS-1055 computer ahead of schedule for delivery to the Soviet Union. On 20 April the general director of the enterprise Heinz Sroka solemnly turned the machine over one quarter ahead of schedule to the Scientific Production Association Niva of BSSR Goskomsel'khoztekhnika [State Committee for Supply of Production Equipment for Agriculture].

Specialists of this committee, TsSU [Central Statistical Administration] of the BSSR and other organizations of the republic are well acquainted with the good GDR equipment. Electronic devices for processing of various types of documentation, for automation of production planning and material and technical supply of kolkhozes and sovkhozes have been used for many years at the computer centers of Niva and in oblast and rayon division of Sel'khoztekhnika. Two generations of machines have been replaced during this time.

According to the tasks of building communism and socialism planned by the 26th CPSU Congress and the 10th SEPG Congress, scientists, designers and engineers of the Robotron Export-Import enterprise have developed even more efficient computers and means of automation which are being demonstrated at the exhibition of computer technology of the GDR at the Scientific Production Association Niva. Among the exhibits is a high-speed small computer, new bookkeeping machines, devices for data gathering and processing with display monitoring and devices for transfer of information from one carrier to another.

Appearing at a press conference with regard to the showing of the innovations of computer technology of the GDR, H. Sroka emphasized the importance of the economic cooperation of our countries and expressed confidence that this exhibition at Minsk will contribute to further development of socialist integration and to strengthening the friendship of the peoples of the GDR and USSR.

The chairman of the Presidium of the BSSR Industrial Trade Board Ye. N. Grinevich greeted specialists from the GDR at the official ceremony of opening the exhibition held on the same day. The deputy chairman of BSSR Gosplan L. P. Metlitskiy, the GDR trade representative in the USSR K. Enkelman and the general consul of the GDR in Minsk S. Bernatek exchanged speeches.

6521
CSO: 1863/169

AUTOMATED SYSTEMS--'CO-AUTHORS' WITH DESIGNS

Moscow KOMMUNIST in Russian No 3, Feb 81 pp 46-47

[Article by M. Osin and Yu. Tyurin, candidates of technical sciences]

[Excerpts] The "Basic Directions in the Economic and Social Development of the USSR in 1981-1985 and the Period Through 1990" draft guidelines devote considerable attention to problems in the automation of labor processes in the national economy, based on the use of progressive scientific and technological achievements.

What is needed for the effective implementation of the CPSU assignment? To what specific point should we draw the attention of scientists and engineers in the immediate future? First of all, the system for the preparation of the data needed for designing (the so-called terminal points) must be "brought closer" to the work benches of designers and technologists. This is achieved by installing widespread computer systems with a number of terminals and individual peripheral minicomputers. Secondly, we must increase the number of active computer users substantially in the design services. They should include people trained in programming and in work with operational computer systems, as well as personnel whose "communications" with computers and machine design systems is based on the use of problem-oriented languages. Thirdly, we must make use of collective dialogue, informationally supported by computers, in design and engineering practice. Fourthly, we must master work with machine design systems and centralized data banks. Fifth, we must improve the means of automated synthesizing of technical solutions and methods of design research under nonspecific circumstances and apply them in our specific design work.

In view of the importance of the use of automated design systems in engineering practice, we suggest that the following sentence be added to Section 3 of the "Basic Directions:" "Systematic implementation of a radical reorganization of the engineering process in all industrial sectors, based on the latest design automation systems, such as to enhance the productive capacity of engineering work substantially."

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HARDWARE

LSI MANUFACTURING PROCESS

Moscow NAUKA I ZHIZN' in Russian No 4, Apr 81 pp 107-110

[Photographic essay by V. Veselovskiy, special correspondent of NAUKA I ZHIZN': "Creation of a Large-Scale Integrated Circuit"]

[Text]

1. This silicon cylinder is cut into thin (0.3-0.5 mm) slices on which are then formed integrated circuits.

2. The polishing and thorough buffing of the silicon slices is performed by these machines.

3. One of the main processes of integrated circuit technology is photolithography. A photomask on the crystal's surface is covered with a photosensitive layer (the photoresist). This creates a complex diagram which then determines the area where the mixtures are introduced and the formation of separate circuit elements.

4

4. Within quartz tubes the silicon slices are placed into the diffusion oven. It is here, under very precisely controlled temperatures, that the mixtures, which form the final ICs, penetrate the windows created by the photolithographic process onto the silicon.

5

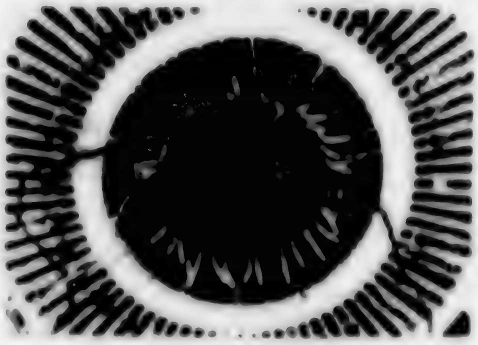
6

5-6. This is the vacuum chamber, where a very thin layer of metal is directed onto the slice. Later from this chamber, again using photolithography, metal field transistor seals and connecting lines will be formed. Several dozen silicon slices are loaded into the chamber simultaneously.

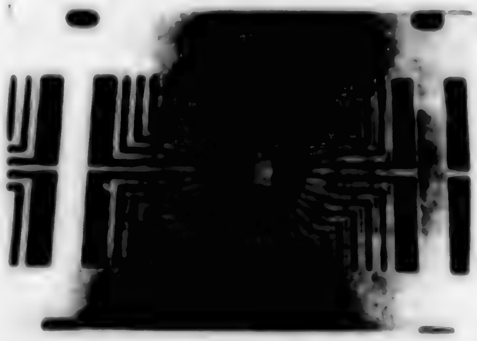
7

7. At this machine, the silicon slices, which have completed the IC production cycle and which have been checked by diagnostic equipment, are cut into individual LSI chips.

8. Each IC is checked during the monitoring process. Faulty circuits are marked.



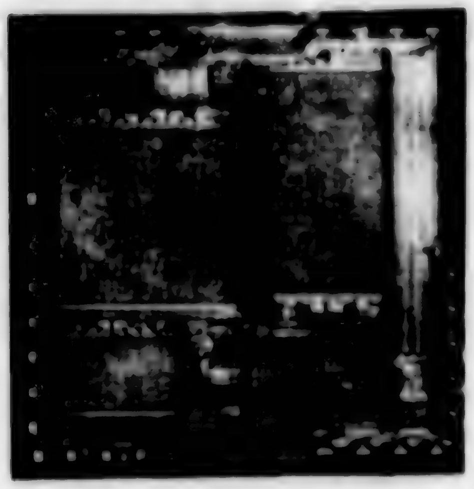
9. The attachment of monitoring devices to the integrated circuit is performed with the aid of sharp metal contacts, which fall precisely on the circuit's monitoring points.

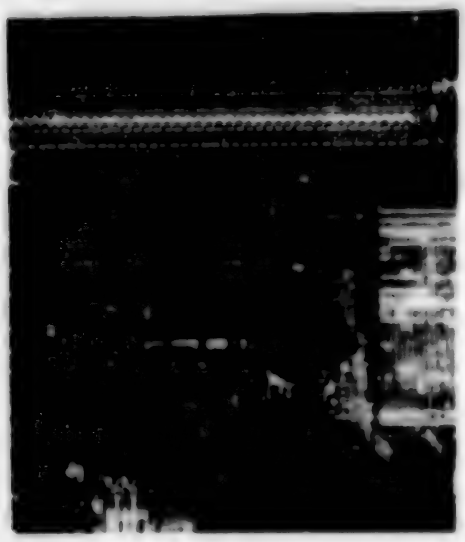


10. One of the last operations is the joining of the very thin circuit wires, formed on the chip, with the flat leads of the future device. Everything is then molded into a plastic housing.

11. IC production is automated to the maximum. Production technology and quality control are performed by automatic electronic systems, utilizing computers.

12. More than one hundred LSI circuits are formed at once on one round silicon slice.





13-14. This is how one LSI pocket calculator circuit looks (photo # 13; the chip size is 5 X 5.2 mm). Photo number 14 shows one small part of the circuit, an adder.

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CSO: 8144/1100-P

MACHINE THAT WALKS BEING DEVELOPED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 Apr 81 p 6

[Article by D. Pipko: "We are Teaching Robots to Walk"]

[Text] Within their circle scientists call this apparatus a "walker" without respect. Although they do see in it a prototype for those walking machines that go anyplace where there are no roads. On our planet or on another. Steep slopes, forest obstacles and rock deposits will not frighten such machines. If necessary they will even cross the rapids of mountain rivers on small logs and will get over the marshes of swamps along the tussocks. But the six-legged robot is walking only in the laboratory of the MGU [Moscow State University] Institute of Mechanics.

"To be completely accurate," says supervisor Ye. A. Devyanin, doctor of physical and mathematical sciences, "we are still only learning to walk."

What could be so difficult here? many ask. Millions of inhabitants of the planet, from the small insect to the mighty elephant, walk, gallop, run and tramp on their legs day after day demonstrating dozens of variations of walking. Any of them may be taken as an example and the problem will be solved. But....

Several years ago specialists in the American firm of "General Electric" built a walking platform with a cabin for a driver-operator. Positioned in it in a special suspended system he should have been able to control each of the four legs of the machine with the aid of two levers and two pedals. Candidates for operators trained long and tenaciously. But even the best of them were not able to master the control of it--literally after several steps they began to err.

"This failure forced us to conduct in-depth research," relates Ye. A. Devyanin, "and as a result to come to the conclusion: there is a kind of barrier which is not within the power of a person to overcome. It would seem as if he receives a wide "range" of movements as a gift from nature, a large portion of which he masters already in childhood before the age of five. But he masters them without thinking--on the unconscious level. And when the necessity arises of controlling the movements consciously then it becomes clear that a person can simultaneously carry out no more than two such movements."

Admittedly this explanation raised even more questions for me. Why did scientists, while creating the "walker," not decline to use the services of an operator? Why did they leave it with not just four but six entire legs? Each one of them has three joints: one makes it possible for the leg to bend at the "knee," the second near the "hip" to go up and down, the third to step from place to place moving the leg in a circle like a compass leg. There is an electric motor on each joint. Eighteen in all. How can an operator keep them in his memory?

"That is not required of him," says the scientist. "The entire task consists of simplifying the control of it to the level of an 'automobile.' Or even to the level of the contact of a rider with his horse. What does this mean? The operator only gives a command of the type 'forward,' 'backward,' 'left,' 'faster,' 'turn in place.' And when this is done the legs move and the 'walker's' control system resolves it by itself."

The principles and algorithm of such a control system were worked out by scientists in the MGU Institute of Mechanics in collaboration with their colleagues from the Institute of Problems in Transmitting Information in the USSR Academy of Science headed by Doctor of Medical Sciences V. S. Gurfinkel. This research, which is being conducted under the scientific direction of D. Ye. Okhotsimskiy, member correspondent of the USSR AN [Academy of Sciences], in many ways predetermined the structural form of the "walker" as well. In particular, the choice of exactly six legs. What led scientists to such an approach?

First of all, the laws of statics. In order for an apparatus to be able to walk it must have a minimum of four legs. Then it will be able to maintain its stability on three of them and take a step with the fourth. But such an apparatus will move very slowly. And nature, seemingly knowing about this, solved the problem in its own way: it furnished all insects, for example, with six legs.

With such a number of legs it is now possible to alter the speed of movement and to employ different variations of walking. For example, when cockroaches run after prey or run from pursuit they employ the fastest gait using "three"--they immediately shift to three legs. Researchers adopted another principle from the centipede--the wave principle. And the "gallop" type of gait did not escape attention where the front, middle and back legs are shifted in pairs. Based on speed of movement the last variation is worse. But if it will be necessary to step over a log lying across a road or a deep crevice, it is impossible to get around without it.

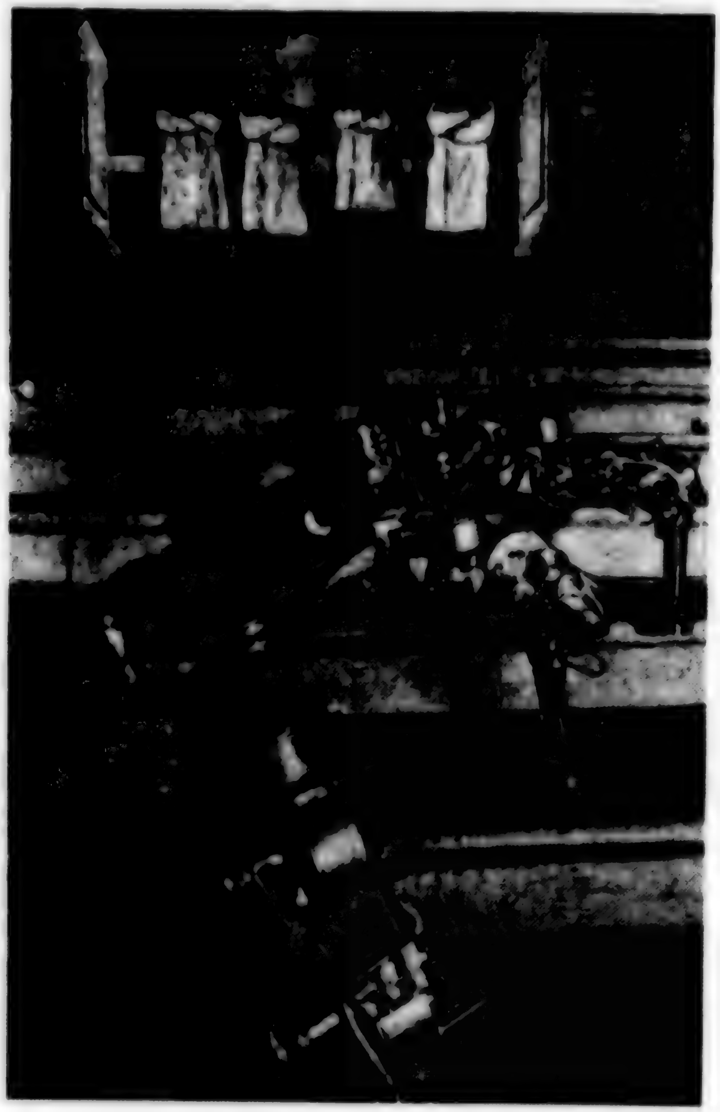
"The 'walker' has gone quite a few kilometers already in the laboratory with supervisory control--by an operator's commands," continues Ye. A. Devyanin in the meantime. "and recently we decided to give it complete independence, having transformed it into a 'one hundred percent' robot. For this an 'eye' was installed on it--a system of technical vision."

The principle of operation for this system is simple: the "walker" sends out a light beam ahead scanning the space lying in front of it like a fan. The reflected signals, falling on a photographic receiver, report on the nature, direction and distance to obstacles.

Seeing how the "walker" confidently surmounts obstacles and easily maneuvers between them one could think that the problem of creating walking machines has already been solved. But Ye. A. Devyanin hurried to cool my ardor.

"There are quite a few problems for which there are still no answers. For example, we were able to reduce the electronic 'brain' of the apparatus to the dimensions of an average size suitcase. But the power "ran out" for the first design. Living creatures actively use the inertia of movements; they only turn on their muscles for work for a short period of time. And when we, for example, attempt to use the inertia of an automobile then we must disengage the wheels from the engine--otherwise it becomes a brake. Even this is impossible to do on a walking machine--the legs bend and it falls. And there are still quite a few of these problems."

Scientists are certainly mastering them as well. And in the meantime the "walker" became one of the heroes of the movie "Man and Robot" filmed at the "Lennauchfil'm" movie studio by producer L. M. Volkovyy. The film relates how industrial robots and the like are ever more frequently coming to the aid of man. And research and experiments with that same "walker" helps them to become more safe and perfect.



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CSO: 1821/70

UDC 681.3:51

USE OF A PROBLEM-ORIENTED AUTOMATED HYBRID COMPUTING SYSTEM TO SOLVE PROBLEMS OF HYDRODYNAMICS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 81 pp 63, 66

[Article by Nabi Rabedzhanovich Rabedzhanov, candidate of technical sciences, Malik Abdussatarovich Sattarov, candidate of physico-mathematical sciences, and Roman Dzhurabevich Kuknariyev, engineer, Mathematical Institute with Computer Center of the Tajik SSR Academy of Sciences, Dushanbe]

[Excerpts] The investigations described in the present article were made on a hybrid computer system consisting of an M220M digital computer, an MN-17M analog computer, and a UP-1 general-purpose convertor [1]. This hybrid computing system was oriented to performing problem tasks which, of course, typically have a certain homogeneity contained in the similarity of the structure of equations and the limited range of variation in the coefficients of the equations being solved, which results from the limited character of change in the structure and parameters of the object under study. These tasks also have a limited range of variation on the order of differential equations being solved, the values of their coefficients, and their righthand parts.

These properties are possessed, in particular, by the differential equations of the filtration process in underground layers. These equations are used widely to solve various applied problems.

The specialized device works as follows. Information travels from the digital part by code lines and on the signal "Start" is received in an input register made from the same number of triggers as there are code lines. From the input register the information goes to the decoder, and then from its output to the amplifier block. The incoming information is decoded in conformity with a printing program written in the digital part of the hybrid system.

The signal goes from the amplifier block to the commutator, where RES-9 electromagnetic relays are used as the switching elements. These relays are superior in characteristics to electronic relays. Because the RES-9 has two contact groups, one of them was used for self-suppression, which made it possible to substantially reduce the volume of equipment in the specialized device and simplify the control diagram.

The number of switchable points in the specialized device that was developed can be raised to $2^{12} - 1$. There are 20 switching points in a module. For the performance of particular problem tasks that are frequently done at the Computer Center where the number of analog decision elements is limited, it is possible to set up replaceable specialized devices that automatically set up the scheme of decision elements in the analog part of the hybrid computer system. The specialized device may solve either one problem of maximum allowable size or several smaller problems whose total size does not exceed the maximum allowable.

This method of solving a boundary problem on a problem-oriented automated hybrid computer system was used for calculations of the regime of waters in the Yakh-Su and Kuybyshevskiy Rayon of the Tajik SSR. The results of the investigation demonstrated the broad area of application of the algorithms developed for solving boundary problems. Specifically, they can be used in designing and operating drainage systems.

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11,176
CSO: 1863/174

ELEKTRONIKA BZ-37 HAND CALCULATOR

Moscow SOVETSKAYA TORGOVLYA in Russian 16 Apr 81 p 4

[Text] From simple arithmetic operations to complex engineering calculations--this is the range of operation of the Elektronika BZ-37 hand calculator.

The calculator performs four arithmetic operations, calculates natural and decimal logarithms and antilogarithms, trigonometric and reciprocal trigonometric functions, extracts the square root, raises to powers and other operations.

The power supply of the device is universal: from batteries or from an AC system.

The cost is 90 rubles.

The hand calculator can be acquired in stores of the organization for trade in goods for cultural purposes and consumers' cooperatives.

6521
CSO: 1863/169

ELEKTRONIKA HAND CALCULATORS REVIEWED

Kiev RABOCHAYA GAZETA in Russian 15 Apr 81 p 4

[Text] Small Elektronika hand calculators are used everywhere: at institutes, in department stores, at enterprises, in institutions and organizations and in schools. They are used by grade schoolers, students, designers, bookkeepers and salespersons--in short everyone who must be involved with various types of calculations. Thus, the stock of Elektronika devices includes many models. Familiarize yourself with the hand calculators which you can acquire in consumer goods department stores.

The Elektronika BZ-18M

The Elektronika BZ-18M performs the following operations: addition, subtraction, multiplication, division, taking logarithms, antilogarithms, trigonometric and reciprocal trigonometric functions, raising to powers, extracting the square root and calculating reciprocals for any real numbers.

The average time of performing operations is not more than 1 second. Power is supplied from a mains through a BP2-3 power supply unit or from self-contained sources--four AZ16 Kvant cells or four D-0.55s batteries. The consumed power (from the self-contained power source) is 0.7 watts. Dimensions are 170 X 86 X 26 mm and mass is 350 grams. The hand calculator is delivered with a BP2-3 power supply unit.

The Elektronika BZ-18M costs 95 rubles.

The Elektronika BZ-19M

This hand calculator can be used to add, subtract, divide, multiply, take logarithms, raise to a power and calculate trigonometric functions. This calculator also records in the memory register and reads out from it. The average time of performing one arithmetic operation is less than a second and the average time of raising to a power is not more than 4 seconds.

Power is supplied from a self-contained source (four batteries of type D-0.55s) or from a power supply unit which is connected to an AC network.

The dimensions are 240 X 170 X 70 mm and mass is 400 grams.

The price of the Elektronika B3-19M is 95 rubles.

The Elektronika B3-18A

The calculator performs four arithmetic operations, extracts square roots, calculates reciprocals, raises to a power, calculates exponents together with "U" and "1" functions, takes logarithms and antilogarithms and calculates trigonometric functions and operations from the memory.

The average time of performing operations is not more than 1 second. The dimensions are 160 X 90 X 40 mm and mass is 360 grams. Power is supplied from batteries or from a power supply network through a power supply unit.

The cost is 95 rubles.

The Elektronika B3-14

The calculator performs four arithmetic operations, calculates reciprocals and percent, performs calculations with a constant and raises to a power.

The calculator is delivered with a D2-10 power supply unit and A-316 Kvant cells. The dimensions are 124 X 73 X 30.4 mm and mass is 300 grams.

The cost of the Elektronika B3-14 hand calculator is 40 rubles.

All the enumerated hand calculators have eight-digit functions.

The Elektronika B3-21

The calculator performs trigonometric and logarithmic functions, reciprocals, squares, extracts square roots, calculates with a constant, records in a memory register or reads from it and also performs four arithmetic operations. It operates in two modes: "Operation" and "Programming." Keyboard operations and operations from a pre-recorded program are carried out in the "Operation" mode. The program of calculations is entered in the "Programming" mode.

The average time of performing operations is not more than 0.5 second.

Power is supplied from a self-contained source (four D-0.55sUP batteries) or from a BP2-3 power supply unit, which is connected to an AC network. The consumed power from the self-contained source is not more than one watt.

The hand calculator costs 190 rubles.

6521
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UDC 681.3.05:681.327.68:788.38

ORGANIZATION OF COMPUTING PROCESSES IN THE STRUCTURE OF A MULTIFUNCTIONAL HOLOGRAPHIC MEMORY

Frunze IZVESTIYA AKADEMII NAUK KIRGIZSKOY SSR in Russian No 6, Nov-Dec 80 (manuscript received 18 Aug 80) pp 18-21

SHABDANOV, M. A., Frunze Polytechnical Institute

[Abstract] A description is given of the structural organization of a multifunctional holographic memory which combines the functions of recording, storing and processing incoming data. It is demonstrated that by adding a small amount of equipment to the structure of a holographic working storage with page organization and an addressable beam it is possible to endow it with data processing functions while maintaining the functions of recording and storing data. The structure described is used most effectively for processing page-organized digital data, in particular, for processing images in real time. The additional equipment consists of a phase set unit and two page set units. The latter are electrically controlled transparencies which serve the purpose of space modulation of the amplitude of the transmitted light beam. If the light beam passes through a given element of the controlled transparency, the state of this element is assumed to equal logical "1" and otherwise logical "0." The phase set unit, also a controlled transparency, is designed for space modulation of the phase of the transmitted light beam. The phase set unit can be constructed from transparencies based on PLZT ceramic plates used in the differential phase mode of operation. Space modulation takes place because of the difference in lengths of the optical path caused by changes in the birefringence thickness of the plate. The functioning of the structure employed in the process of performing logical operations is discussed. Raw data are loaded from a processor and the results are entered in a buffer storage from which they either enter the two page set units as page operands or the processor for further processing and for reading out results. The address of the page operand to be processed, from the processor, enters the address register of a control unit. This address register generates signals which switch a deflector. At the same time the page operand to be processed is entered in page set unit No 1 from the buffer storage. By means of control signals from the control unit, a laser beam from a coherent radiation source is linearly polarized by means of an electrooptical polarization switch and the beam is transmitted by means of a modulator to the deflector, whereby the deflector deflects the laser

beam to a specific location of an array of holographic lenses in conformity with the address entered. This is a two-dimensional array of permanently stored holograms which increase the angular divergence of the light beam to illuminate the entire aperture of page set unit No 1. Each lens is designed for entering holograms in just a single location in the working data medium. The light beam is reflected by a mirror and is split by means of a semireflecting mirror into two beams, one of which is used as a eference beam and the other as the object beam. The latter is reflected by a mirror and passes through a film polarizer, the lens array and page set unit No 1 and undergoes amplitude space modulation in keeping with the data contents of page set unit No 1. The modulated light beam is focused by means of a lens onto a specific location of the working data storage with the address assigned. The reference beam arrives at the same location and the interference pattern formed by these beams is recorded. The exposure time is controlled by the control unit. This concludes the process of recording a hologram of a page of binary data representing the first operand of a logical operation. Descriptions are given of the functioning of the structure described in performing the modulo-two addition operation and OR and AND logical operations. Additional shift registers connected to the photodetector array are used for processing images in a multifunctional holographic working storage structure. These registers shift the page operand to the right, to the left, up and down. The image is digitized and comes out of the processor in the form of a binary page operand which is processed in parallel in each cycle step. The algorithm used for the elimination of noise in the structure discussed is presented. Figures 1; references 4 Russian.
[159-8831]

SOFTWARE

UDC 681.3.06

SYSTEM FOR SETTING UP AND OPERATING A DATA BASE ON M6000 ASVT-M MAGNETIC DISKS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 81 pp 134-135

[Article by Yuriy Arsen'yevich Fokin, engineer, Volgograd]

[Text] Designation, Functions, Special Characteristics.

The general M6000 software does not have adequately elaborate general-purpose means to set up, monitor operationally, and edit files of arbitrary structure that make up the information base of any automated control system or industrial processes using a real-time disk operating system (DOS).

The system for organization and operational management of a magnetic disk data base (SOVBD) is expected to fill this gap and spare the user the necessity of developing applied programs to shape disk files by feeding data from standard devices. Use of the SOVBD also permits operational tracking and modification of the current content of files during the functioning of the automated control system.

The system realizes the following functions:

a. feeding data and shaping magnetic disk files;

b. editing files;

c. outputting descriptions (the contents) of files;

d. sorting files;

e. copying files from magnetic disks to punched tape and vice versa;

f. outputting entries and elementary data to display or printing units;

g. editing entries from keyboard units;

h. truncating files.

The presence of data that describe the structure of the files is an essential condition for executing almost all of these functions. Therefore, the system has one more function: feeding and shaping magnetic disk files that contain this information, and it is required that for every user file there be a file that describes its structure.

The SOVBD is an interactive (dialog) system. It was developed using the library of subroutines of the file control system included within the real-time DOS. The SOVBD is essentially a logical complement to the set of operator commands of the file control system for the broadest class of data arrays, files of arbitrary structure using any of the internal data representation techniques adapted in the M6000 except representation with doubled precision. The specially developed library of standard subroutines for internal transformation of information translates data from one form of notation to another.

The minimum configuration of the computer complex necessary for the functioning of the SOVBD includes the following: an M6000 processor; a memory of 24,000 words; magnetic disk storage; and, a printer with keyboard. Other input-output units may also be used such as photoreader from punched tape, a display module, or a broad-format printer.

The system may be connected to the real-time DOS in the process of generation or by the shipping loader of the real-time DOS in the modification (supplementation) mode. For its operation it requires at least 6,500 words of memory allocated during generation in the domain of background resident disk problems.

The time of performance of operations on the files depends chiefly on the type of functions being performed, the size of the files, and the input-output units used. The outputting of files is controlled by the speed of the output units. When files are being shaped from punched tape it takes 10-15 seconds for 1,000 bytes of input data.

The technique for a preliminary estimate of the time required to sort files requires special investigation. The results of two tests made in a real-time DOS with a minimum volume in the domain of background residenct disk problems can give some idea of sorting speed: 20 seconds for a file of 50 blocks and 15 minutes for a file of 500 blocks. In both cases the length of an entry was 32 memory cells and the total size of keys in an entry was four cells.

Description of Information Base

All the data with which the SOVBD operates and can be classified by its purpose into three groups.

Basic files — these are user files on magnetic disks or copies of them on punched tape. They are designated for use in the problems of the specific automated control system and are the objects of organization and management for the SOVBD. This group includes files with random data and entries of fixed and variable length. Three types of internal representation of the elements of the entry are also possible: binary numbers in a fixed point, binary numbers with a floating point, and alphanumeric characters. It is possible to pack several elements into one cell or to place one element into adjacent memory cells. The length of an entry must not exceed 256 words and the number of elements in an entry cannot be more than 55.

The descriptive files contain information about the structure of the basic files. Each basic file is a descriptive file which contains the name of the file, its size, the entry length, the number of elements in an entry, their format, the type of quantity, and the location in the entry.

The raw data for forming the descriptive files as well as the basic files is fed from punched tape or keyboard.

The control information determines the selection, function, and final result of the work of system programs. It is formed by the standardized directives of the operator in response to requests issued by the system to the console of the SOVBD operator. The requests are generally represented as abbreviated Russian text and contain a suggestion for the responding directive. From three to five levels of request, which both give and detail the assignment, are established depending on the function. There is one request corresponding to each level and the response to it may contain up to five parameters of the assignment. The system provides for rejection of issuing the directive at any level with subsequent abolition of the directive and issuing another request at the preceding level.

Information for the user — the SOVBD can output information for the user in document form concerning every file included in the system. On the paper tape of the printers in real time it is possible to obtain a description of the file with or without a cap, a fragment of the file description with the group of entries, or a fragment of an entry with the value of one or several elements. The user can receive the last two types of information on the screen of the display module. The file description can be outputted in two or more columns, while entries are put in two or more lines in cases where the length of the line being outputted is greater than the length of a line of the buffer output unit.

The SOVBD consists of nine functional blocks. Each block performs one of the designated functions of the system. They are loaded for execution by the control block. All of the blocks are in the form of background resident disk problems.

The files created by the SOVBD are entirely within the sphere of application of the file control system. The files directly formed by this system cannot, generally speaking, be managed by the SOVBD. This is because of the special characteristics of the organization of SOVBD files. For each user file there must be a descriptive file; all user files must contain the same code for the end of the file in the first cell of the next entry.

The SOVBD can be connected in to the software of an automated control system for industrial processes as a subsystem that provides:

a. the creation of a norm-reference base for the automated control system for industrial processes on magnetic disks;

b. operational monitoring and editing of reference and operational information on magnetic disks during the process of system functioning;

c. expansion of the information base of the existing automated control system for industrial processes when new problems are included in the system;

d. creation and management of an ordered archive of norm-reference data on punched tape.

In addition, the SOVBD can be used to debug software for operational formation of files with debugging and test information, varying this data, and receiving file descriptions.

The SOVBD was developed and introduced at one of the organizations in Volgograd. Program debugging time was cut by 30 percent through its use.

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NETWORKS

UDC 681.327.1

MULTIPURPOSE PROGRAMMED REMOTE PROCESSOR FOR USER STATIONS OF COLLECTIVE-USE COMPUTER CENTER

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 81 pp 101-104

[Article by Yanosh Pavlovich Doriy, engineer, Special Technological Design Bureau for Software of the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences]

[Text] The current phase of development of collective-use computer centers and integrated automated control systems involves intensive introduction of various remote data processing systems [1] which increase the loading of expensive equipment at the collective-use centers and improve user access to its information and computing resources. The introduction of various types of packages of applied programs within the framework of series-produced remote processing hardware makes it possible to expand the functional capabilities of operating systems and provide users with such work regimes as remote batch processing (UVZ package) [2], remote dialog debugging and launching of programs in execution (DUVZ and SRV packages delivered within the framework of the YeS [Unified System] Operating System), remote access to data bases (KAMA [3] and OKA [4] packages), and others.

The series-produced user stations of the Unified System of Computers usually carry on operations with one definite package of applied programs. Thus, installation of one user point at a user station affords him the possibility of dealing with just one type of package. But users often need different work regimes for the same subscriber station and the collective-use computer center and access to different applied packages. This can be achieved either by purchasing and installing several types of user points at the user stations or by simulation at the station of any user point that provides interaction with the necessary packages of applied programs. The second way requires development of a special user station which can support work by remote users with several packages of applied programs that together perform practically all the important functions of the user station.

It is possible to achieve good economic and technical characteristics for the functioning of a collective-use computer center specifically by setting up a multipurpose user station for remote data processing based on an inexpensive minicomputer. We describe below the principles of functioning of such a user station and a multipurpose programmed remote data processor that provides such a user station based on an SM-3 (or SM-4) minicomputer.

Structure of the Hardware

Figure 1 below shows possible variations of the structure of user station hardware based on an SM-3 (or SM-4) minicomputer and its interlinking with the processor of a collective-use computer center based on one of the models of the Unified System (for example the YeS 1040 or the YeS 1060).

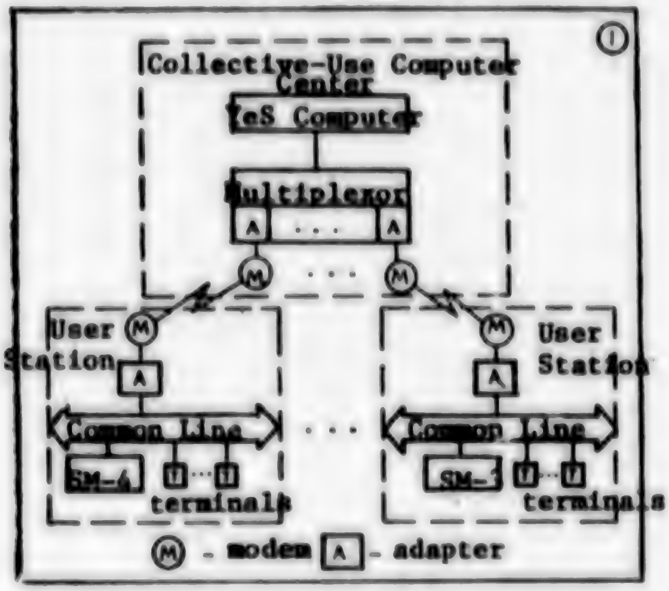

Figure 1. Structure of the Hardware of the User Station and Collective-Use Computer Center

The hardware complex of the user station includes the user terminals and system units for input-output, data storage and processing, and remote communication with the computer center. The terminals (displays and typewriters) provide user interaction with the software and hardware available at the user station and computer center. The system devices for input-output and data storage and processing include the basic means included within the SM-3 (or SM-4).

The means for remote communication between the user station and the computer center include two groups of devices. The first belongs to the user station and includes a synchronous communication adapter for which the adapter developed by the Special Design Bureau of Mathematical Machines and Systems of the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences can be used. The YeS 8010 or the UPS-1-TF signal convertor may be used as the modem. The second group of devices belong to the collective-use computer center and include YeS 8403 data transmission multiplexors, SA-2 synchronous adapters, and modems of the same types.

The exchange of information between the SM-3 (or SM-4) and YeS computer should take place in KOI-7 code and in the transparent mode (code-independent transmission).

In the transparent mode information should be converted to DKOI code at the user station before its transmission in either direction.

The Functional Capabilities of the User Station

A user working at a user station should have access to the following functional capabilities.

Preparation and editing of assignment at the user station. The terminal user at the user station works in the medium of the minicomputer real-time operating system and has access to the services of the operating system. For example, the text editor of the real-time operating system permits the user to perform the following operations:

a. read a page of text from the input file;
b. prepare a new file on magnetic disks or punched tape;
c. place the text of a file in a buffer for later editing;
d. make changes in a file and check them;
e. write a page into the input file.

The editing process is very simple and flexible because of the large group of commands, each of which is coded by one or two letters.

Transmission of assignments for performance by the collective-use computer center. Programs (or arrays of data) prepared at the user station may be transmitted by communications channels to the YeS computer for execution (or processing). After the assignment has been transmitted for execution the user may cancel it or demand information on the state of its processing, that is, determine whether at the particular moment the assignment is in the input (or output) queue or being run on the computer.

Displaying the results of execution of assignment. The results of the execution of an assignment may, at the wish of the user, be outputted on the peripheral devices of the YeS computer or transmitted to the user station. In the latter case the user may demand immediate transmission of results after execution of the assignment or transmission on command of the operator. The results received may be outputted on any system output unit of the user station: printer, punched tape, magnetic disk, or videoterminals.

Remote launching of catalogued procedures on the YeS computer. This function makes it possible to start up procedures catalogued on a YeS computer in advance with output of results on the computer or at the user station. When this function is used the user prepares only control cards with a certain name and enters them in one of the system input units of the user station, then transfers them to the computer center, initiating performance of the catalogued procedure.

Access to a data base. This is one of the most important functions. It permits the user to store his data centrally at the collective-use computer center and use it collectively when necessary. The data may be outputted on the system output units of the YeS computer, the analog units of the user station, or on videoterminals.

Interactive program debugging. The mode of interactive (dialog) exchange between the user at the user station and the YeS computer must be provided to debug programs, which are then added to personal libraries in the YeS computer. This provides editing, translation, and execution of programs by command, that is, the standard debugging functions.

Communication among programs. If the machine at the user station is working in a real-time mode with a certain experimental unit, it becomes necessary to organize exchange between the programs being run on the SM computer and the YeS computer, for example to insure automatic access to a centralized data base or distribute computations between the user station and the computer center. Such communication is accomplished automatically without user intervention.

Communication with the operator of the YeS computer and the operators at other user stations. This function enables a user to carry on conversation with the operator of the YeS computer. For example, before initiating assignments to execute the user may check the availability of the required volumes of magnetic tape or disks, receive information on the availability of resources in the YeS computer, or perform other subsidiary functions. In addition, he can transmit a message or the results of the performance of his assignment to another user station.

Analysis of these functional capabilities shows that they can be realized as follows. On a YeS computer the capabilities of the YeS operating system (in this case version 6.1) are expanded by the UVZ, SRV, and KAMA applied packages. The user station formulates software to support protocols for dealing with these packages and realize all macrocommands corresponding to the basic telecommunications method of access.

The Special Technological Design Bureau of Software of the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences is developing a multipurpose programmed remote processor for the SM-3 (or SM-4) for work with a real-time operating system.

Structure of the Remote Processor

Figure 2 below shows the structure of a multipurpose programmed remote processor that functions under the control of the SM-3 (or SM-4) real-time operating system. The processor is constructed on the two-level hierarchical principle. The macrocontrol modules that realize interaction between

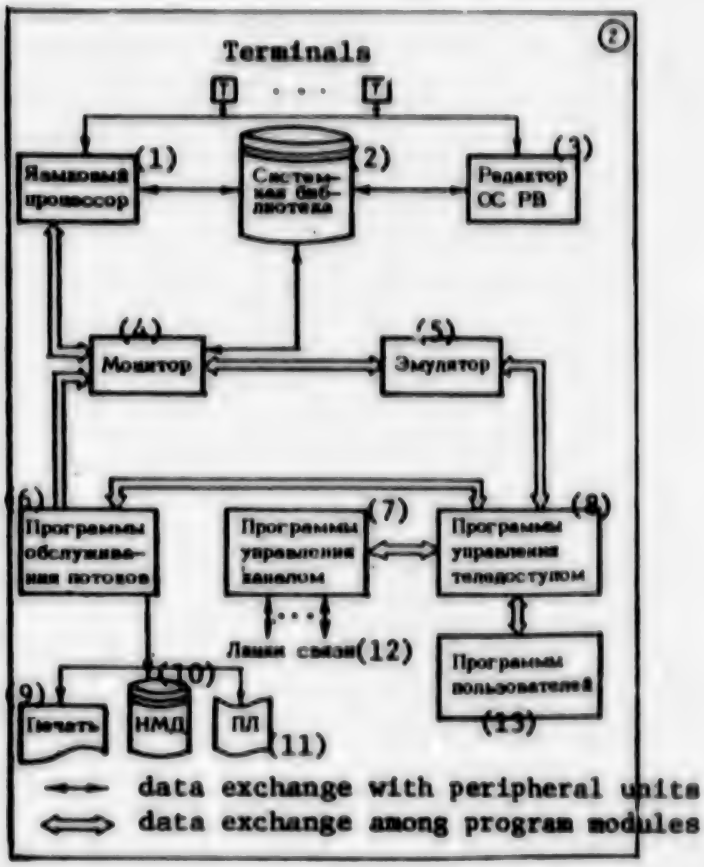

Figure 2. Functional Diagram of the Interaction of the Modules of a Remote Processor

Key:
(1) Language Processor;
(2) System Library;
(3) Editor of Real-Time Operating System;
(4) Monitor;
(5) Emulator;
(6) Programs To Serve Flows;
(7) Programs for Channel Control;
(8) Programs for Control of Remote Access;
(9) User Programs;
(10) Printer;
(11) Magnetic Disk Storage;
(12) Punched Tape;
(13) Communications Lines.

the user station and the user are located on the upper level. The lower-level modules realize microcontrol and insure the transmission, receipt, and monitoring of information on the communications channel [5].

The macrocontrol modules include the language processor, emulator, and monitor. The language processor provides an interface between the user and remote processing equipment employing local and remote control commands. The local commands are executed immediately at the user station, providing users with additional services. The remote commands are performed on the YeS computer and are specific commands.

The local commands are divided into three groups: initialization, control, and reference. The principal local commands are as follows.

The initialization command ASSETS causes the compilation of tables that identify user stations, the number of the port of the collective-use computer center, user, and the like. The command ACCOUNT can be used to correct these tables. The command LOGIN serves to connect the user to a port, and the command LOGOUT disconnects him from the port. The command UNITS assigns the input-output unit of the user station which the user wants to employ in the remote processing process. On the command LIST the user receives information on the hardware of the computer center and a set of directives of applied packages.

When remote commands are fed the language processor performs syntactical control of the format and operands of these commands, modifies them when initiating jobs that can be done both at the computer center and user station, and transmits them to the collective-use computer center.

The emulator contains a set of program modules which support work with the UVZ, SRV, and KAMA packages on a YeS computer and realize the IBM/2780 and YeS 7920 work algorithms for user points.

When working with the UVZ package the user employs the remote batch processing mode both for transmission of program (assignments) and initiating catalogued procedures on the YeS computer. Work with the SRV package permits efficient interactive debugging of programs on the YeS computer. With the KAMA package the user has access to centralized data bases.

The monitor controls the work of all modules of the multipurpose programmed remote processor and sanctions user access to the system.

The microcommand modules include programs to control the channel, programs to service flows, and programs to control remote access. The channel control program provides linear drives that support that receipt and transmission of data to the communications line through synchronous communications adapters. The programs for control of remote access organize data exchange with the YeS computer in conformity with the BSC protocol for synchronous data transmission, which is supported by the SA-2 adapter of the YeS 8403 multiplexor.

The BSC protocol envisions setting up rules for synchronous transmission of binary data. The functions of the BSC provide efficient data transmission on communications channels. This information is transmitted in the form of binary characters and comprises textual information (the basis of the message), the information title (identification of the message and its destination point), and control characters that divide the message into parts and control its transmission.

The input language of the access method is a language analogous to the BTMD (Base Telecommunications Method of Access) in the YeS operating system. The language includes macrocommands TOPEN and TCLOSE for opening and closing the logic channel, the macrocommand TRLATE for recoding data, and macrocommands for reading and writing, which have several subcommands apiece. TREAD realizes the initial reading of the request, the continuation of reading, a repeated reading, reading of the request, and interruption of the reading; the command TWRITE realizes the initial entry (with clearing), continuation of writing in the transparent mode, continuation of writing in the interactive (dialog) mode, continuation of writing in the interactive transparent mode, writing the request, writing of the latency, and writing with clearing (transmission of the control character "for end of transmission" to the YeS computer). Unlike the macrocommands of the base telecommunications method of access the macrocommands for remote access of a user station permit data exchange between the station and the YeS computer only on a nonswitchable communications channel.

Using the remote access macrocommands a programmer may organize communication between programs at the user station and on the YeS computer (in this case the macrocommands of the base telecommunications method of access are used).

The programs to service flows are set up to organize recoding of data being transmitted and received, analyze and monitor errors that occur, and establish input and output queues at peripheral units.

Conclusion

The multipurpose programmed remote processor was developed as general-purpose software for the user stations of a collective-access computer network. Specifically, it can be applied in automated territorially distributed control systems and scientific collective-use computer centers to automate the processing of experimental data with preliminary data processing and control of the experiments by means of minicomputers.

FOOTNOTES

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PROBLEMS OF DEVELOPING STATEWIDE AUTOMATED SYSTEM DISCUSSED

Moscow EKONOMIKA I MATEMATICHESKIYE METODY in Russian No 2, Mar-Apr 81 pp 39[illegible]-398

[Article by N. A. Balashova]

[Text] Investigations are now being carried out on a wide front in all sectors of the national economy and in scientific and academic centers of the country to improve management based on the use of means of automation, computer technology and economic and mathematical methods. Prerequisites have been created for their effective use by combining information gathering and processing into a statewide automated system for accounting, planning and management of the national economy (OGAS) on the basis of the state computer center network (GSVTs) and the statewide data transmission system (OGSPD) and thus methodological, hardware, information, software and organizational unity of the system should be provided. The significance of the All-Union Intersector Seminar "Problems of Developing a Statewide Automated System for Information Gathering and Processing for Accounting, Planning and Management of the National Economy (OGAS)," held in Moscow on 12-16 February 1980, is determined by this.

The seminar was convened by the USSR State Committee for Science and Technology, the USSR Academy of Sciences, USSR VDNKh [Exhibition of Achievements of the National Economy] and by the All-Union Scientific Research Institute of Problems of Organization and Management (VNIIPOU GKNT SSSR).

Approximately 200 reports on the following problems were heard and discussed during its work:

--improvement of the economic mechanism in light of the decree of the CPSU Central Committee and USSR Council of Ministers dated 12 July 1979;

--investigation of the socioeconomic prerequisites and consequences of automation of management of the national economy under conditions of developed socialism;

--integration of agency automated systems into OGAS on the basis of their methodical, hardware, software and information unity to enhance the efficiency of their functioning and processes of their design;

--the technology of solving specific intersector problems;

--the methodology of development and functioning of collective-use VTs [computer centers] (VTsKP), GSVTs and OGSPD as OGAS hardware;

--development, storage and utilization of OGAS software;

--organization of information and construction of a data base system in OGAS;

--the status of work to improve management of science and technology on the basis of using computer technology.

The seminar emphasized the fact that development of an OGAS should be based on an understanding and utilization of objective economic laws with regard to the tendency to improve the system of management of social production and scientific and technical progress; a systems approach to design of an OGAS assumes the need to take into account a wide range of economic, social, organizational, scientific and technical aspects of the given problems.

The OGAS was considered in the reports and talks not only as an information system, but also as a system that contributes to complex improvement of economic management by means of new methods and devices. This determines the role and place of the OGAS in the socioeconomic system of developed socialism, determines the objective prerequisites of its development and functioning and establishes its main tasks and functions.

Investigations are now being conducted on the problem of organizing interaction of the automated systems of control bodies--a necessary condition of their integration into an OGAS. Proposals have been prepared and introduced on paired automated exchange of information of individual ministries and agencies for solution of specific intersector planning and management problems.

Design of economic and mathematical models at many scientific centers of the country encompasses classes of problems of sector and territorial management in all spheres of activity and at all levels of national economic management. Work has begun on preparation of a complex system of economic and mathematical models of OGAS as the basis of its functioning: the principles of developing a system and the sample status of models have been determined.

The basis of OGAS hardware is collective-use computer systems (VSKP) that include computer complexes and remote processing and data transmission devices which are being developed within the unified computer system.

The functional capabilities and quality of systems software of the YeS EVM [Unified computer system] were increased significantly, preparation is proceeding toward development of VTsKP software and information-computer networks and there are already some data base management systems. All this is prerequisites for design of a distributed information processing system. Investigations are under way on standardization of software for solving functional problems of ASU [Automated control system] of different levels and complex programs are being developed.

The organizational base of preparation and utilization of the OGAS software is the GosFAP (State Fund of Algorithms and Programs) system developed in the country that combines sector (agency), intersector specialized and republic (territorial) algorithm and program funds. Data bases are functioning in a number of sectors and agencies of the country and they have achieved special development in the RASU [Republic automated control system] of the Latvian SSR.

The discussion revealed a number of deficiencies related mainly to agency dispersion of developers and to weak coordination of their work. There is no unified program for organizing interaction of automated systems of national economic management bodies, while scientific and technical programs on problems of OGAS development are inadequately interrelated. Some lag is noted in introduction of economic-mathematical models into the practice of planning calculations and sector management behind the level of their theoretical development. An approach oriented toward individual problems predominates in design and analysis of ASU efficiency and therefore little attention is devoted to preparation of data bases on management facilities. The effectiveness of introducing All-Union classifiers and a standardized documentation system is still low.

It has been pointed out in the seminar's recommendations that OGAS as a complex information-computer system should be developed by stages by purposeful program planning methods. It requires that a method of interaction of automated control systems and solution of specific national economic problems be worked out within intersector, sector and territorial management complexes directly influencing the final results of economic functioning.

More attention must be devoted to standard ASU and standard planning solutions to provide organizational, functional and information interaction of systems by determining the leading sectors, agencies and scientific research institutions responsible for solution of specific scientific and technical problems of interaction within the intersector, sector or territorial complex.

When designing a GSVTs as the technical base of OGAS, it is recommended that the existing procedure of computer equipment design and equipping of VTs be reviewed: the goal should not be individual computers and devices, but VSKP that include remote processing and data transmission equipment in addition to computer complexes. The problem of complex postulation, debugging and turning over to the customer of VSKP designs arises in this regard.

It was suggested with regard to data exchange in the GSVTs that special attention be devoted to batch switching systems, development, adaptation and standardization of protocols based on recommendations of the corresponding international organizations and development of a number of communication miniprocessors on the basis of which a unified remote information exchange system would be possible within GSVTs and OGSPD. To accelerate practical work on development of the technical base of OGAS, experiments must be carried out on complex checking and processing of the basic components and design principles of GSVTs and OGSPD and of different modes of their interaction; determination and development of new hardware and software for expanding the sphere of interaction of GSVTs and OGSPD components; and development of the methodology for solving specific intersector and sector problems of national economic management and processing organizational and functional problems of user interaction with use of computer equipment in the network mode.

The requirement of coordinating the work on design of the OGAS system at leading academic, agency and sector institutes engaged in fundamental and applied problems of economic-mathematical modelling was especially emphasized.

The seminar contributed to drawing together various approaches to problems of OGAS development and consequently to acceleration of design and to increasing the efficiency of agency automated systems and to supporting the possibility of integrating them into an OGAS.

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EXPERTS DISCUSS COMPUTER DATA BANKS FOR THE SOCIAL SCIENCES

Moscow PRAVDA in Russian 16 Mar 81 p 3

[Article by V. Vinogradov, director of the USSR Academy of Sciences Institute of Scientific Information for the Social Sciences and corresponding member of the USSR Academy of Sciences, and V. Khisamutdinov, chief designer of automated control systems for the social sciences and candidate of physicomathematical sciences: "Asking a Computer Questions"]

[Text] During the general meeting of the USSR Academy of Sciences in March last year many of its participants engaged in dialogs with a machine. A display unit (a "television set" with a keyboard similar to that of a typewriter) and a printer hooked onto it were set up in the House of Scientsists. And the computer was located in the building of our institute near the "Profsoyuznaya" subway station. Questions asked on the keyboard were reproduced on the screen and simultaneously transmitted along a regular telephone line to the computer. Virtually instantaneously the system found the necessary information in the magnetic disk storage and flashed out the answers on the screen, and if so desired, on the printer also.

This was the first public demonstration of an interactive data system on the social sciences operating in remote access mode. When it was operating many members of the USSR Academy of Sciences received answers to their own requests for information on materials that were new and interesting not only for social scientists but also for representatives of the natural and technical sciences. The rector of the Moscow Physico-Technical Institute academician O.M. Belotserkovskiy saw here the possibility of improving the work of departments of social sciences in terms of the ideological-political training of the students and postgraduates of the institute. As a result, an agreement was signed for scientific cooperation, and a data center terminal for the social sciences set up at the Moscow Physico-Technical Institute is being activly used by the departments of the social sciences. Experiments have also been conducted to make data searches from the scientific information centers for the social sciences belonging to the Belorussian SSR and Estonian SSR academies of sciences, using regular intercity telephone channels and based on the data bank at our institute.

The need to develop automated data systems and networks in the field of the social sciences is dictated by the increasing role of these disciplines in socialist society and the need for immediate processing of large volumes of data both in the conducting of scientific research and for decisionmaking at all levels of leadership. The use of a computer makes it possible not only to substantially improve the provision of data but also to largely alter research processes themselves. Social scientists have at their disposal a tool for mathematical methods and an opportunity to develop any kind of data base on socioeconomic processes. Understanding the importance of this task, the collective of our institute offered for industrial operation, a month ahead of the planned schedule, in November last year, a startup unit for an automated data system for the social sciences.

Within the framework of the unit, data on Soviet and foreign literature on economics and philosophy is processed and inputed to the computer. The data include bibliographies (author, title, publication, year of publication, page number), annotations, and also a list of terms that together make it possible to form a judgment about the content of a given publication. These terms also form the "search patterns." About 50,000 documents are now inputted to the system each year.

The data bases are used not only to search for required information but also to prepare data publications. Thus, starting with the first editions of 1980, the bibliographic references for literature on Soviet and foreign economics are being prepared for press in the computer and the proofs are being printed by an automatic photocomposer. The first editions of references for philosophy prepared on the same equipment were published in January 1981.

What kind of new possibilities are being opened up by automated data backup in the field of the social sciences? First of all it should be said that the circle of clients that our institute services as an all-union data organ, is broad. It includes scientists at the humanities institutes in the social sciences section of the USSR Academy of Sciences, workers in party and state organs, the professorial staffs at VUZ's and the network of party-political education. And since 1976, with the academies of sciences of the socialist countries an International Information System has been developed for the social sciences. The institute is also working with data centers in the developing countries, West Europe, the United States and Canada. In total, the range of clients for the system that has been developed is counted in hundreds of thousands, and accordingly its full-scale development and introduction is of great significance both in our country and on the international level.

The planned subscriber network of USSR Academy of Sciences humanities institutes will become an integral part of the academic network. However, the specific nature of the social sciences, the range of problems that are solved, and the need to develop and renew specialized program packages for processing socioeconomic data require the organization of a special network based on existing institutes. Within its framework, our institute would be able to service a reference and switching center for subscribers.

The development and introduction of automated data systems at the institute, and also in the socialist countries, became the first steps in the formation of this structurally very complex network. The tasks set for social scientists by the 26th CPSU Congress require further movement along this path. During the 11th Five-Year Plan, the most important and promising direction will be the development of data networks, a unique symbiosis of the data and computing systems and the communications network. Setting them up is a complex task that assumes joint efforts by scientific and design establishments associated with computer equipment, communications and data system specialists, and the data users.

It is already clear, however, that it will be necessary to solve a number of other problems. Thus, the high cost of leasing dedicated (nonswitched) intercity, and particularly international, communications channels is slowing down the development of scientific and experimental work to develop data and computing networks. Evidently, it is advisable for the USSR State Committee for Science and Technology and the USSR Ministry of Communications to examine the question of introducing concession rates in this case. At the same time it should be a matter of concern to develop as rapidly as possible equipment that provides for switching traffic within the computer networks, which will make it possible to change over to payment for actual time used to pass traffic.

Progress in computer technologies and communications systems is offering new possibilities for giving clients access to large data banks in interactive mode. In our institute we have already started on experimental industrial utilization of prototype for such systems. A system similar to that operating at the Moscow Physio-Technical Institute has been set up in the faculty of computer mathematics and cybernetics at the Moscow State University for the humanities faculties and in the USSR Academy of Sciences Institute of World Economics and International Relations.

Of no less interest is the joint work of the USSR Academy of Sciences Institute of Scientific Information for the Social Sciences and the Bulgarian Academy of Sciences Center for Scientific Information. Since February last year Bulgarian scientists using equipment set up in Sofia have been making data searches on the data base of the Institute of Scientific Information for the Social Sciences in economics. Responses to queries are presented on a CRT display. The work is being done using a special four-wire communications channel. But this is only a beginning. The possibility of organizing similar experiments for scientists in Vietnam, Cuba and Mongolia using satellite communication is very interesting, and developments on mutual access by Soviet and Western scientists to data bases and information networks in the corresponding countries are promising.

The institute's demonstration of the possibilities of the system has attracted a great deal of attention from the representative of scientific and production organizations of various ministries and administrations, VUZ's, party organs and the political education network. The institute has received dozens of letters requesting inclusion on the list of subscribers to the automatic data backup system. However, we have frequently been forced to refuse because available resources are limited. There is a lack of computer capacity and only a few display units. There is no equipment for interfacing with the communications channels for long-distance users. Delays in providing the institute with equipment is putting back the commissioning of a full-scale system, and this is having a negative effect on data backup for Soviet social scientists. We hope that the USSR State Committee for Science and Technology and the USSR Academy of Sciences will give us some real help.

And so, the foundation of a very important matter has been laid. Now it is essential to make rational use of the available opportunity. The introduction of up-to-date automated systems and networks for the social sciences will undoubtedly promote the solution by Soviet social scientists of the important theoretical and practical scientific tasks set for them by the 26th CPSU Congress.

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ALL-UNION CONFERENCE ON COMPUTER SYSTEM DESIGN ANNOUNCED

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 81 p 142

[Announcement: "Attention, Readers!"]

[Text] In September 1981 the 6th all-Union conference on problems of designing and building collective-use computer systems and computer centers will be held in Minsk. The purpose of the conference is to summarize experience with the design, set-up, and operation of collective-use computer systems (VSKP's) and collective-use computer centers (VTsKP's) and to identify promising directions in the use of computer technology. Plans for the conference envision broad discussion of the following problems related to VSKP's and VTsKP's:

1. methodology of design and systemwide questions;
2. structural questions of computer complexes and organizing intermachine exchange;
3. modelling networks of computers, VTsKP's, and their elements;
4. the impact of VTsKP's and VSKP's on integrated economic and social development of the regional economy;
5. software of the VTsKP and VSKP, means of organizing and controlling the computing process, and network measurements;
6. data processing technology and software;
7. organizational-legal and economic questions;
8. designing automated data processing systems (automated control systems) for VTsKP users, selection of users, and the fund of algorithms and programs.

Persons wishing to take part in the work of the conference must send the Organizing Committee abstracts of their papers (up to four typewritten pages in two copies) no later than 1 June 1981. In addition to a letter of recommendation from the organization and two copies of the security affidavit, general information should be included with the abstract: the field to which the report relates; the full name of the author; information on the academic degree, place of work, and position of the author; an address for correspondence.

Abstracts of reports received by the Organizing Committee and properly submitted will be published before the work of the conference begins.

All materials should be sent to the following address: 22070, Minsk, Prospekt Partizanskiy, 14, Belorussian Branch of the All-Union State Technological Planning Institute of the USSR Central Statistical Administration, Organizing Committee of the 4th [as published] All-Union Conference on Collective-Use Computer Centers. Telephone for further information: 46-47-52.

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APPLICATIONS

YES-1065 PRODUCTION TO BEGIN

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 Feb 81 p 3

[Article by L. Voynich, fitter at the Minsk production association for computer equipment, Komsomol Lenin prize winner, delegate to the 26th CPSU Congress: "The Highway of Progress"]

[Text] As in any sector, progress in electronics is rapid. It was only three years ago that we started the series production of the YES-1060 and YES-1035 computers. And recently, as noted in our precongress pledges, the jubilee numbers of both computers were made.

But for our designers this is already water under the bridge. Together with the technologists they are already preparing the YES-1065 for the production line. This computer will be the most powerful in the country, capable of simultaneously solving two independent problems of different complexity. Forging rapidly ahead into the future is, of course, the most valuable quality of the association's collective. And this is seen not only in the steady improvement in the product. Were our shops like they are today five years ago, or even two or three years ago? Their appearance has changed before our very eyes. And I do not judge this only from my own shop. Every day I pass through the section where enterprise veteran Galina Vladimirovna Glushchuk works. She is a measurement of operative and checks the quality of cables. Was it so long ago that she was called a manual worker, wasting so much time and bored with the monotony of the operation. And today she loads the cable into an automatic device and immediately obtains the information on the location and nature of the fault. Automation is the main direction of technical retooling at the enterprise. By altering the nature of the work and its methods it not only improves work conditions but also makes it more qualified and interesting. People's response to this concern for them is to improve their production activity and show more initiative. The association coped successfully with the planned targets for the 10th Five-Year Plan. The volume of output increased by a factor of 2.7.

The collective is now working at maximum output. By the opening of the 26th CPSU Congress more than 3,800 workers had fulfilled the program for two months.

The collective greeted the party congress with unprecedented friendly and cohesive relations. Mutual assistance became a law of life in all sections and shops. How my comrades cheered me before I departed for Moscow; they said that they would do my norm for me so that my absence would not affect the production affairs of the section.

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AUTOMATED SYSTEM FOR CONTROL OF PRODUCTION PROCESSES REPORTED

Moscow EKONOMICHESKAYA GAZETA in Russian No 10, 1981 p 20

[Excerpt] The complex scientific and technical program "Automation of control of production processes, plants, machines, machine tools and equipment using mini- and microcomputers" has been confirmed. It was developed by the USSR State Committee on Science and Technology jointly with ministries and agencies.

The program provides for creation of 85 pilot models of ASU [Automated control system] of production processes and also eight pilot models of automated control systems for machine tools, machines and units. The cost and design periods of similar systems will be considerably reduced due to repeated use of the developed technical documentation.

The principles of application of microprocessor computer equipment for automation of new production processes, units, machines and plants can also be debugged on the basis of the pilot models. To accelerate and reduce the cost of development, the ASUTP [Automated control system for production processes] will be provided with standard algorithms and programs and also with programming systems for automation of software development of systems. All this along with design of the pilot models will make it possible to increase approximately twofold during the 11th Five-Year Plan the saving from introduction of ASU compared to the 10th Five-Year Plan.

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LABOR SUCCESS OF THE AZERBAIJAN SSR CSA REPUBLIC COMPUTER CENTER

Moscow VESTNIK STATISTIKI in Russian No 3, Mar 81 pp 31-39

[Article by T. Ter-Izrael'yan]

[Text] For the collective of the Republic Computer Center of the Azerbaijan SSR Central Statistical Administration [CSA] the Tenth Five-Year Plan was a time of intensive creative labor. It was precisely in those years, accomplishing tasks arising for state statistical agencies from resolutions of the 25 CPSU Congress and subsequent plenums of the CPSU Central Committee, the Republic Computer Center collective achieved considerable successes in the fulfilment of tasks. According to the results of the All-Union socialist competition of colletives of the Main Computer Center and the Central Computer Center of the USSR CSA and the republic computer centers of the union republic CSA's the Republic Computer Center of the Azerbaijan SSR CSA was repeatedly awarded prizes. Thus, in the first and second quarters of 1978 it was a winner in the socialist competition, in the third quarter of that year it was in second place, and in the fourth it received a Certificate of Honor.

In the second quarter of 1979 the Republic Computer Center again became a winner in the All-Union socialist competition, in the first quarter of 1980 it was awarded the Certificate of Honor of the USSR CSA and the Central Committee of the Trade Union of Workers of State Institutions, and in the second occupied second place. This is only a short list of evaluations of the work of the collective, behind which stands the persistent intensive labor of each worker and the organizing and educational work done by the management of the center and its party, Komsomol and trade union organizations, the Main Administration for Personnel Training of the CSA of the republic and the management of the Azerbaijan SSR CSA, in particular, the former chief of the Azerbaijan SSR CSA, S. K. Abbasaliyev, who has done much for the development of the statistical service of the republic and its computer system.

The Republic Computer Center is a complex system consisting of ten subdivisions in which 583 persons are employed. "And it is important to arrange people in the collective," says the center's director, Mamedov Shakhbala Aggyrakh-ogly, "so that they give the greatest benefit to the matter and have everything needed for labor productivity and all possibilities of displaying and improving their capabilities. With us everyone knows his duties well, is ready to go to the aid of a comrade, to encourage and restrain, if necessary. Obviously, a great deal depends on the microclimate, on the established style of work."

Sh. Mamedov, deputy chief of the Azerbaijan SSR CSA and director of the Republic Computer Center, has been working 22 years in government statistical agencies. In

1968 he was awarded the title of "Honored Economist of the Republic." He is a member of the CPSU raykom, a deputy of the rayispolkom, chairman of the planning budget commission of the ispolkom--this is a short list of the work done by Sh. Mamedov in addition to his basic work. "I have worked for a long time in the system of state statistics," he says, "figures and their analysis have bcome the basis of my working life." Sh. Mamedov discussed the center in detail and acquainted us with the people working in it.

The close creative collaboration of the entire collective of the Republic Computer Center for many years in a situation of comradely mutual help and mutual understanding creates favorable conditions for elevation of the general working level and the successful fulfilment of set tasks.

Any conversation about the work usually starts with the results of the economic activity of the collective. High results of such activity--that is the essence of socialist competition, which is widely developed here.

The Republic Computer Center was formed in 1968 on the basis of the Machine Calculating Station of the CSA of Azerbaijan and four sections for the preparation and issuance of statistical materials. Now we have 29 sections. The center is equipped with four computers, 255 punched card and keyboard calculating machines, and also four machines of the "Romayor" type. Statistical reports are obtained from enterprises, organizations, ministries and departments by the sections for preparation and issuance of statistical materials. They are actively assisted by sector sections of the CSA in the preparation of reports and lists, in the analysis of work of sectors of the national economy, participate in tests of the reliability of report data, the organization of conferences on the question of compilation of statistical reports, etc.

By issuing more than 100 bulletins characterizing the course of fulfilment of the State Plan for the Economic and Social Development of the Republic, the Republic Computer Center provides the management bodies of the republic with necessary operating data. It should be noted that annually on the average 25 percent of the statistical reports are presented ahead of schedule.

To reduce the periods required for processing statistical reports and increase the responsibility of executives for each report according to the technological stages, each month a planning schedule is compiled for the computer production of documents and the issuance of statistical bulletins. In the first half of 1980 alone, of 35 produced complexes of electronic data processing 18 were issued ahead of schedule.

In addition, in the computer preparation of annual reports a planning schedule is compiled for the transmission of documents to keyboard, punched card and electronic machine shops and the copying and duplicating press with an indication of the number of reports and the days and hours when the materials will be issued, and also the persons responsible for accomplishing the work. The schedule is coordinated with all the sections, approved by the director of the Republic Computer Center and strictly monitored. In the computer operation section the duties are strictly distributed among engineers for preparation of annual reports.

In the center much attention is given to the correct planning of work. In accordance with the summary annual plan of statistical work and the schedule for the presentation of the statistical report to the USSR CSA, the CSA of the republic and local management bodies, a monthly plan of work of sections for preparation and issuance of statistical materials is compiled. Plans are made for the participation of the sections in tests of the reliability of report data, one-time reports and examinations and in the accomplishment of work apart from the plan. Each economist compiles an individual work plan with indication of specific periods of execution. Accomplishment of the plan is monitored daily by section chiefs and CSA management. A general work plan for the Republic Computer Center also is compiled, and special plans for the preparation of annual statistical reports by computer. The Republic Computer Center director, his deputies and the chiefs of the corresponding sections of the center have a list of all this work.

Data on the presentation dates and the quality of statistical work after, after computer preparation in the form of a control summary, go to the management of the Azerbaijan CSA Republic Computer Center.

"Monitoring and verifying the implementation of adopted decisions, L. I. Brezhnev has pointed out, "is a very important part of organizer work." "Guided by this indication of the general secretary of our party," says Republic Computer Center chief engineer R. Eyubov, "a special program 'Monitoring Execution' was developed and introduced by the efforts of specialists of the center. All work of the center, current and long-range, has been monitored since 1977. This experience has been used by other computer centers of the country and many ministries and departments. In 1977 the course of development of annual reports began to be monitored, and now all correspondence has been embraced by monitoring. This is, in essence, the rudiments of a Republic Computer Center automated control system," says the chief engineer.

Work with the enterprises is patient and steady. At first there were many delays in the presentation of report data. The Republic Computer Center management and its party, Komsomol and trade-union organizations did much work to reinforce labor discipline. They began to organize checks of the state of report discipline and the quality of reports presented by enterprises, organizations, ministries and departments and to write letters about violators of report discipline in various instances to the Committee of People's Control of the republic with an indication of specific enterprises disrupting the presentation of reports, to rayon committees of people's control and to CPSU raykoms. Chiefs of republic computing and data processing stations and centers have been requested to adopt measures on observance of report discipline in rayons where there are enterprises and sovkhozes constantly violating the periods for report presentation. The same material is also sent to the Council of Ministers of the republic. On the basis of those letters very strict measures are being taken toward violators of report discipline.

In the course of 1980 the sections sent 300 such letters and telephone messages.

One of the main areas of the work of statistical bodies is assurance of the quality and reliability of report data, which depends to a great extent on the state of report discipline. At the Republic Computer Center, paramount importance is attributed to this question. Each quarter a schedule plan is compiled and approved by the management of the CSA of the republic; in it a check of the state of report discipline in the field is planned and the dates for report presentation and quality are indicated. The compilers of reports are also invited to the Republic

Computer Center. All these measures, the checkings, instructive conferences, letters and the registration of erroneous recordings in reports in special books improve the report discipline of enterprises, organizations, ministries and departments and have a positive effect on the quality of summary statistical reports. The management of the Main Computer Center of the USSR CSA has no claims for quality and presentation times of data of the Republic Computer Center of the Azerbaijan CSA. The chief of the Main Computer Center of the USSR CSA, Yu. Vasil'yev, evaluating the work of the Republic Computer Center collective, said that the interrelations of the Main Computer Center with the Republic Computer Center are based on a distinct work rhythm--the basis of principles of the statistical service.

The sections for preparation and issuance of statistical materials provide the USSR CSA and local managements of the republic with over 600 reports monthly.

The economic results of the work of any collective form first of all in its structural subdivisions. The results of the work of the Republic Computer Center involve a definite organization of work of each subdivision. Working without laggards--this began to be achieved at the Republic Computer Center in 1978 and was achieved in 1979. It can now be said that the center is the flagship of mechanization in the republic, a unique forge of personnel for other computer centers (many Republic Computer Center specialists are now the directors and chief engineers of computer centers of departments and ministries).

At the Republic Computer Center much importance is attributed to socialist competition. The management, party, trade-union and Komsomol organizations of the center start first of all from the fact that the competition must be a stimulus to improvement of the efficiency and quality of work. The results are summed up monthly, quarterly and for the year as a whole. In that case they think above all of improvement of the technology and educational work with the personnel in each subdivision of the center. Ant the organization of the competition is based on publicity, complete information about adopted obligations and the periods required for their fulfilment, and also about the material and moral incentives. Let us say, they have completed such enormously complex and laborious work as the population census, have issued the results 70 days early and of good quality--the same collective report on this by issuing a special subdivision placard. The competition has already bypassed the stage in which it is necessary to develop it in width--at the Republic Computer Center everyone competes; it is time to advance it in depth--to aim each worker toward obtaining the best results. Of course, what was said above is only a portion of a large complex of carefully thought-out measures which includes also elevation of qualifications (they think about this here all the time!) and the general educational level of the workers (for example, many operators are studying at VUZ's and technical schools) and organization of their spare time (a comfortable complex of a rest zone is being constructed).

Attention also is attracted by this characteristic. Where they cannot give the name of the better without preliminary investigation, and also those of the lagging if required, where they promise to determine more precisely even the most important figures, the work proceeds accordingly. Of course, there are facts and figures which must be rechecked once more to avoid errors. But there is ordinary everyday humdrum work and in that work there its leaders, valuable initiatives, and successful and unsuccessful experiments--a real manager knows about this. Rena Guliyev, chief of the mechanized developments section, also knows about this.

Her labor biography started here. In 1957 she arrived at the center: she completed the planner's course and the finance and credit courses, and then was graduated from the institute. Since 1963 she has been head of the VKM and VPM [expansions unknown] sections. She has 146 operators and 11 engineering and technical personnel in her section. The section head does much work on the training of operators; she instructs them. There are mainly youths in the section, and she knows how to work with them. Yes, the price of true selflessness is understood by all, especially when they say of her: she is like a mother to us. In the mechanical developments section the system for training new employees is strict and well thought-out. They are taught and involved in the common cause. And it is not surprising that after a year or two the girls start to capture the leading bonuses. In the process of learning, not only their standards and wages increase but confidence in their own powers appears.

R. Guliyeva discussed the pre-congress socialist competition, in which the mechanized developments section also was actively included. In the rooms where the VKM and VPM work hang pennants reading "Collective of Communist Labor" and "Shock Worker of Communist Labor." But, as is known, the honorary title "Collective of Communist Labor" is awarded under the condition that at least two thirds of its workers have earned the title of "Shock Worker of Communist Labor." "We strictly and painstakingly monitor the fulfilment of assumed obligations, and that assures reality of the competition," says R. Guliyeva. The collective is coping successfully with the plan and the indicators of the Five-Year Plan have been fulfilled. And ahead are new tasks of the Eleventh Five-Year Plan. All the Republic Computer Center operators are raising their qualifications; six of them are graduated from the finance and credit technical school each year. Every year in March a republic competition for the best operator is held. A similar competition is held before that at the Republic Computer Center. Here are the best operators of the mechanical developments section who won prizes in the republic competition: L. Akhmedova, G. Niyarova, N. Petunskaya, Yu. Shakhnovskaya, S. Zaliyeva, etc.

The most important subsection in a modern computer center is the operations center which, like other Republic Computer Center sections, has a definite work schedule, compiled on the basis of the entire work plan. The section has been awarded the title "Collective of Communist Labor." The section strictly plans the data processing periods by computer for all stages of the technological process. F. Gadzhiyev, section chief, talked about thw work of the section, in which there are 21 persons, and noted the high qualifications of the specialists, who fairly rapidly mastered work on the YeS computers in disk operating system and operating system modes. The section prepared form No 1 on a YeS computer. The planning of tasks has raised the section specialists to a qualitatively new level. The section's tasks include the introduction of a second line of the automated system of state statistics (20 tasks developed in the USSR CSA system and 5 developed in the Azerbaijan SSR CSA Republic Computer Center have been introduced). The section tested programs of the subsystem "Transport" (authors of the subsystem of the Kirgiz Republic Computer Center), comments were read, the plan was reworked and, after experimental introduction and acceptance by the commission the subsystem was included in the second line of the automated system of state statistics. The main work of the section is current statistical reports which are prepared on computer. As a rule the workers of the section introduce 5-6 rationalizer proposals per year.

In the section, as everywhere in the Republic Computer Center, much attention is given to socialist competition. In the forefront are shock workers of communist labor.

"To really master one's profession is no small goal," thinks B. Bunim, chief of the section of algorithmization and programming of economic and technical-engineering tasks. The section (41 persons) is completely made up of local VUZ graduates, and all its workers have mainly a specialized higher education. Programmers at the Republic Computer Center have a fairly high level of mathematical preparation and constantly improve their qualifications.

The section for algorithmization and programming of statistical tasks (which includes 14 persons, with F. Dzhalilov as chief) does responsible work on the subsystem "Supply of materials and equipment," which has been included in the USSR CSA coordination plan. Five statistical forms have been automated (Nos 1, 2, 3, 4 and 9): Nos 1-4 in the first line of the authomated system of state statistics and No 9 in the second. The formulation of the tasks changed in connection with change of the forms. The formulation and technical assignment arrive from the Main Computer Center and the software is developed by the Republic Computer Center. "We try to link the forms into a single complex," says F. Dzhalilov, "on the basis of unified software, that is, to have them produced according to the same procedure. The work of the economist is facilitated above all, the economist who can readily change from studying one form to another without preliminary preparation. Also facilitated is the work of operators, since for all forms there is a single reference base and a single enterprise catalogue (the latter curtailed the folume of perforation and the volume of reference information). The program complex was developed by specialists of the section and distributed to all computer centers of the oblast and republics by the USSR CSA. If any sort of changes occured in the complex, the sections introduced correctives and again distributed the programs to all centers.

It must be noted that, together with the solution of new economic and scientific-technical tasks, sometimes in the section programs or tasks are worked out which have already been worked out and solved at other centers. All this occurs, evidently, because of difficulties in the development of tasks on all levels of the computer system as a result of lack of uniformity of the technical base of the USSR CSA system.

The operating dispatch syction was organized relatively recently at the Republic Computer Center. The section is headed by an experienced, knowing specialist, L. Chekushina, who in 17 years of work at the center has learned all the fine points of statistical work. For work on the census Lyudmila Akimovna received the medal "For Labor Prowess." Strict and demanding toward herself and others, L. Chekushina, chairman of the people's inspection group, has arranged matters so that s special place in the work of the group is occupied by analysis of statistical data and the comparison of indicators in the dynamics and with plan indicators.

One of the leading Republic Control Center subdivisions is the section for preparation and issuance of statistical materials on capital construction (S. Aliyeva, head). In the section work is clearly distributed among the economists, each of whom strictly monitors the arrival of reports, registers them and compares them with the presentation schedule. After checking all the errors committed a report is made by letter to the management of the reporting organizations. After being checked strictly against the schedule the statistical reports are transmitted for processing, often ahead of schedule. In the years of the Tenth Five-Year Plan all the reports to be processed arrived well-prepared. Every quarter the work of the section was discussed in production meetings.

In the section, of 11 workers 10 are shock workers of communist labor. Among them, for example, is senior economist V. Popova, who has been working there 15 years. She is a teacher of the young and has helped many to master skills of economic work. All years of the Tenth Five-Year Plan the section was awarded the honorary title of "Collective of Communist Labor" and it has repeatedly been a winner in the socialist competition at the Republic Computer Center. It has been a winner twice in the All-Union socialist competition of brigades, sections and other collectives of the USSR CSA system for increase of the effectiveness of production and quality of work and successful fulfilment of socialist obligations, and has been awarded a Certificate of Honor of the USSR CSA and the Central Committee of the Trade Union of Workers of State Institutions.

There are 21 persons working in the duplicating section, on the work of which the technical level of the formulation of materials developed at the center depends. Its chief, S. Khachaturov, has initiative, constantly thinks about the best use of available technology and introduces a large number of rationalizer proposals. This is one of the few centers of the USSR CSA system in which foils are recovered by their own efforts; 40 percent of its cost is saved per year. The section trains personnel for rayon computer centers since, unfortunately, in the centralized procedure no one in Azerbaijan prepares personnel in operative polygraphy (even in the polygraphic technical school).

Rationalizer work is done intensively at the Republic Computer Center, and competitions are held for the best rationalizer proposal (among the winners have been B. Bunim, L. Khanatayev, etc). Other centers often appeal to Republic Computer Centers specialists to introduce a given proposal.

In the years of the Tenth Five-Year Plan alone 299 rationalizer proposals have been proposed and introduced into production: the saving from their introduction amounted to 218,500 rubles. The rationalizer proposals of Z. Dzhargiyev, F. Gadzhiyev, M. Avakyan, M. Suleymanov and F. Dzhalilov were adopted and included in the short list of rationalizer proposals introduced into the USSR CSA computer system. The results of the work of the collective are evidence of its maturity. Whereas in 1975 there were 2 or 3 electronic data processing complexes, in 1980 there were 40 of th The economy from the introduction of the second line of the automated system of state statistics, according to preliminary calculations, amounts to 300,000 rubles and about 180 persons have been released from work.

The production plan for volume of work at the wholesale value for the first half of 1980 was fulfilled by 102.4 percent, and on the computer by 104.0 percent. Production expenditures per ruble of performed volume of work were reduced by 3.6 percent. The average daily loading was 14.0 hours for all types of electronic computers, 10 for tabulating machines, 11.4 for calculators and 12.9 for adding machines.

The new Five-Year Plan, in the opinion of director Sh. Mamedov, will be new evidence of still greater successes of the Azerbaijan SSR Republic Computer Center, which will become an enterprise collective of communist labor!

Special note should be made of the purposeful work of the Main Administration of Personnel Training of the CSA of the republic on the further improvement of the activity of computer installations of the Azerbaijan CSA system. A result of that work is constant fulfilment of the plan by all computer installations of the republic. Obligations of the Five-Year Plan tasks were fulfilled by 216 operators of computer centers and stations by 22 April 1980, and 13 collectives of the computer network and 1,329 workers supported the initiative "Work Without Laggards."

The collectives of the Sal'yanskiy and Narimanovskiy rayon computing and data processing centers and Astarinskiy and Marturinskiy rayon computing and data processing stations have supported the initiative and assumed increased socialist obligations to worthily greet the 26th CPSU Congress. The collectives have pledged to fulfill the planned tasks for 1980 earlier than the set date.

The Main Administration of Personnel Training of the CSA of the republic also does much organizational work on the mechanization of accounting and the introduction of complex mechanization of accounting in kolkhozes, sovkhozes, enterprises and organizations. Complex mechanization of accounting has been introduced in 53 kolkhozes enterprises and organizations. Tauzskiy, Sal'yanskiy and Khachmasskiy rayons have been defined as rayons for the complete introduction of complex mechanization of accounting in all forms.

The computing and data processing center of state statistics of Sal'yanskiy rayon is one of the leading centers in the system of the Azerbaijan SSR CSA, one which repeatedly receives prizes for the results of competition in the CSA system of Azerbaijan. Gathering and processing data, the center always presents it in time and in good quality. It must be noted that the chief of the Azerbaijan SSR CSA Republic Computer Center, Sh. Mamedov, the chief of the Main Administration of Personnel Training, E. Rakhmanov, and the secretary of the CPSU raykom, F. Shiraliyev, have highly rated the work of the Sal'yanskiy rayon computer and data processing center.

The manager of the center, S. Ismailov (he has many different diplomas, promotions, is a member of the rayon editorial commission and a deputy of the rayon soviet) spoke willingly of the rayon in which he works and the people with whom he works. "The main sectors in the rayon are cotton growing, animal husbandry and many industrial facilities. It was not so long ago, I recall well, it was determined in a statistical work how much effort you expend on data collection and processing. Now computer hardware has greatly facilitated the work, but the matter is already solved when you put your mind to analysis of those figures. In recent years our people have improved in both mastery and attitude toward the matter."

For example, this is what the first secretary of the CPSU raykom, F. Shiraliyev, has said about the work of the Republic computing and data processing collective: "A statistical service is priceless, especially if it works as at Sal'yany. There is a very good collective at the center."

Yes, reliability and precision at the center represent an unalterable law, and the people working there assure this (and therea are 107 of them). Some of them are: D. Kuliyeva, a repeated winner in the republic competition for the title "Best Operator," each year winner of a prize (often first prize) in republican competitions; D. Aliskerova, an operator who always takes first or second place in the republican competition of operators; mathematician programmers A. Ganifayev and M. Samedov, whose names have been inscribed in the books of honor of the USSR CSA and the Azerbaijan SSR CSA, electronic engineer A. Aliyev, whose photograph hangs on the board of honor in the Azerbaijan SSR CSA, A. Ibadov, deputy chief of the Republic computing and data processing center for mathematical methods, M. Kerimov, chief engineer, and A. Gasanov, deputy chief of the Republic computing and data processing center for statistics. And these are the activists of the center: Z. Aliskerova, secretary of the party organization, Z. Azizov, Komsomol secretary, Z. Bagirova, mestkom secretary. Here at the center new technology is organized, plans are developed, they seek, they find. They know well there that information is necessary for a completely defined goal, for decision making. It is precisely for this reason that they have a responsible attitude toward the collection and processing of data on the rayon. And it is not surprising that the volume of information processed increases more and more. Whereas at the start of the Five-Year Plan the volume of work amounted to 150,000 rubles in wholesale value, in 1980 it was about 240,000 rubles.

At two kolkhozes of the rayon complex mechanization of accounting has been introduced on an M-5000 punched card computer complex (still only section 1 of the standard USSR CSA All-Union Standard Technological Planning Institute plan)--the station specialists deserve much of the credit for this. In the republic that center is the control point for introduction of complex mechanization of accounting. At first it was introduced on computer punched card machines, and now on the M-5000 punched card computer complex.

It can be imagined how multifaceted the life of such a collective as the rayon computer center is. In the foreground of the work here is the organization of new equipment and technology, assurance of the reliability of report data and the report presentation dates. They strive all the time to curtail their statistics. New technology renders them important help in this matter.

Workers of the center are premeated with consciousness of the enormous social importance of statistical work in the country, and this is a powerful impetus for their constant improvement.

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RESULTS OF THE WORK OF THE USSR CSA COMPUTER SYSTEM

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[Article by N. Gorbatov]

[Text] The CSA [Central Statistical Administration] computer system at the present time is a unified complex which functions on a khozraschet basis. Its scales are truly enormous. Thus, the technical base of the USSR CSA system consists of 2,862 computer centers and stations, among which there are 510 computer centers of all levels and 2,352 punched card centers and computing and data processing centers in administrative rayons and cities. In 1976-1980, 180 new rayon (or municipal) computing and data processing centers were created. It also is of no little importance that more and more computer centers and stations are being put in well-equipped quarters. In the years of the Tenth Five-Year Plan alone more than 200 new buildings were built for computer centers and stations.

Implementing USSR CSA measures flowing from resolutions of the 25th CPSU Congress and subsequent plenums of the CPSU Central Committee, positions and conclusions stated in speeches of the general secretary of the CPSU Central Committee, comrade L. I. Brezhnev, the collectives of organizations of the computer network have done much work in the period of the Tenth Five-Year Plan to further increase the efficiency of production and quality of labor and the implementation of designated measures flowing from resolutions of the congress. The Tenth Five-Year Plan for the total volume of work was completed ahead of schedule, on 24 November 1980. In October 1980 the Five-Year Plan for volume of work was completed by the computer systems of the CSA's of the Lithuanian SSR, the RSFSR, the Latvian SSR, the Estonian SSR and the USSR CSA Central Computer Center; in December by the USSR CSA Main Computer Center and the CSA's of the Ukrainian, Belorussian, Uzbek, Kazakh, Azerbaijan, Moldavian, Kirgiz, Tadzhik, Armenian and Turkmen union republics.

The mechanized preparation of more than 1,700 statistical projects is assured automatically and in time, and more than 6,000 developments with consideration of periodicity of presentation. The periods required for the completion of many statistical developments have been considerably reduced.

As before, the paramount task of the USSR CSA remains the improvement and development of mechanized and automated processing of statistical information. The proportion of statistical developments in the total volume of work was 18 percent in 1980 as against 15 percent in 1977, with the following distribution (in percentages).

Units	Statistical developments in the total volume of work	
	1977	1980
Total for the USSR CSA computer system	15.0	18.0
including:		
USSR CSA Main Computer Center	70.5	85.9
USSR CSA Central Computer Center	16.0	41.1
Union republics CSA Republic Computer Centers	35.7	43.5
Oblast level	22.7	28.1
Rayon level	7.4	7.5

The volume of work done by the USSR CSA computer network was distributed as follows (in percentages):

Units	Total volume of work		Work done on computers	
	1977	1980	1977	1980
Total for the computer system	100.0	100.0		
including:				
at computer centers of all levels	52.0	60.2	100.0	100.0
USSR CSA Main and Central computer centers	3.1	3.6	6.8	6.9
Union Republics CSA Republic computer centers	7.2	8.3	19.4	17.2
Computer centers of statistical administrations of ASSR's, krays and oblasts	24.5	28.4	51.8	53.0
Republic (Main) computing and data processing centers	17.2	19.9	22.0	22.9
Punched card centers of statistical administrations of ASSR's, krays and oblasts	0.2	0.2	-	-
Republic (Main) computing and data processing centers and punched card centers	47.8	39.6	-	-

Evident from the presented table is the process of concentration of computing and data processing work at computer centers, the proportion of which amounts to 18 percent in the total quantity of organizations, and in the volume of work done by them, to over 60 percent of the total volume of work of the USSR CSA computer system.

The accounting records of 92,900 enterprises and organizations of the national economy are now being kept at computer centers and stations of the USSR CSA. The complex mechanization of bookkeeping is a very effective form of data processing. It has been introduced into 2,542 agricultural enterprises, including 1,875 such enterprises in 1976-1980 alone. Work has been completed on the introduction of complex mechanization of bookkeeping in all kolkhozes and sovkhozes of 39 rayons of the country. In the area of introduction of complex mechanization of bookkeeping in all sovkhozes and kolkhozes of the republic the Latvian SSR has been successful; it is now considered a republic of continuous complex mechanization of bookkeeping in kolkhozes and sovkhozes.

In November 1980 the second unit of the automated system for state statistics was put in industrial operation. Among the most important directions of that work are the further development of a systems technology for statistical accounting work, increase of the degree of integration and improvement of existing EOI [expansion unknown] complexes during their change to a new technical base (YeS computers), and also the development of new EOI complexes. At present 110 electronic data processing complexes are in industrial operation in the CSA system, 21 of them having been introduced during the Tenth Five-Year Plan. The first line of the data bank of the automated system for state statistics was created and introduced at the VTsKP [shared multicomputer center] of the Tomskaya Oblast Statistical Administration, the VTsKP of the Estonian SSR CSA, the VTsKP of the Belorussian SSR CSA and the USSR CSA Main Computer Center.

Definite work is being done on the creation of the first line of the system of remote statistical data processing. An experimental unit of that system has been organized in the Main Computer Center of the USSR CSA and the Republic Computer Centers of the CSA's of the Ukrainian, Belorussian and Estonian SSR's. The system has been prepared for reception in experimental operation.

To assure the automated and mechanized processing of materials of the 1979 All-Union Census of the Population the USSR CSA has created 29 multiple-user computer centers, equipped with modern computers. The computer processing of those census materials was completed ahead of schedule on the basis of the latest technology (the first line). Classifiers for 125 statistical accounting forms have been introduced into the electronic data processing complexes.

The task of the State Five-Year Plan for the development of the national economy in 1976-1980 on the creation and introduction of shared multicomputer centers into operation has been completed. In 1979 an interdepartmental commission accepted into operation with high evaluations shared multicomputer centers in the cities of Tallin, Tula and Tomsk, and in 1980 that in the city of Minsk. Remote data processing technology has been developed on the basis of YeS computer hardware and introduced under industrial conditions. Standard design solutions have been developed with respect to hardware and software and a number of questions of legal organization have been solved; this assures the conditions for the further development of work on the creation of new shared multicomputer centers on the basis of the better computer centers of the USSR CSA system.

A complex plan has been prepared for the development of the USSR CSA computer network in 1981 with consideration of the requirements that all its indicators be balanced, and such a plan is being worked out for 1981-1985 and for up to 1990.

Work on fulfilment of the resolution of the CPSU Central Committee and the USSR Council of Ministers "On improving the planning and intensifying the effect of the economic mechanism on increase of the efficiency of production and the quality of the work" receives the everyday attention of computer center and station collectives. The computer network now has at its disposal the necessary normatives and methodical documents to carry on the economic activity of computer centers and stations.

The following have already been developed and approved: standard time quotas for the programming of tasks for computers at computer (computing and data processing) centers of the USSR CSA system; recommendations on the development of the structure and determination of the standards of numbers of workers of a union republic CSA GUVR [expansion unknown]; new standards for the introduction into operation and use of general purpose computers with programmed control.

Work is being done continuously to raise the qualifications of personnel. During the years of the Tenth Five-Year Plan over 35,000 specialists in mechanized accounting took courses at educational institutions of the USSR CSA Main Administration for Personnel Training, in the "Algorithm" system and at manufacturing plants; 40,000 operators studied directly at computer centers and stations. Over 16,000 supervisors and specialists of mechanised accounting of the USSR CSA system improved their qualifications.

A considerable contribution was made to the successful solution of tasks facing the USSR CSA computer system by socialist competition, the development of the movement for a communist attitude toward labor, instructorship, improvement of the quality of work done, of professional mastery and creative initiative, completion of the annual planned tasks and of the Tenth Five-Year Plan as a whole ahead of schedule. Various forms of socialist competition, including team competition as well, have been organized in collectives of the USSR CSA computer system. Among the operators, who constitute over 60 percent of all workers in the computer system, an All-Union socialist competition by occupation is being conducted for the title "Best operator of the USSR CSA computer system." Thus, 23,700 workers of the USSR CSA computer system, including 22,400 operators and 833 subdivisions of computer centers and stations completed fulfilment of the Five-Year Plan tasks ahead of schedule, by 22 April 1980.

In the USSR CSA system the movement of instructorship, initiated by organizations of the UkSSR CSA computer system, became developed and widespread since 1975. In fulfilment of the resolution of the board of the USSR CSA and the presidium of the Trade Union of Workers of State Institutions entitled "On intensifying the propagation of experience of winners in the All-Union socialist competition to increase the efficiency of production and quality of work and successfully fulfill the tasks of the Tenth Five-Year Plan" in the USSR CSA computer system work is being done on the study, generalization and distribution of the advanced experience in the organization of socialist competition.

Operator competitions conducted in the CSA of the union republics play a positive role in disseminating the experience of production leaders. This work is done especially actively in the CSA computer system of the RSFSR, Ukrainian, Azerbaijan, Lithuanian, Moldavian and Estonian SSR's and other union and autonomous republics and the Main Computer Center of the USSR CDA.

Socialist competition on individual duties and personal creative plans on a contractual basis has become widespread in the USSR CSA. The initiatives of the leading Rostov enterprises "Work Without Laggards," "Five-Year Period of Efficiency and Quality--the Workers' Guarantee," "From High Quality of the Work of Each to High Efficiency of Labor of the Collective," etc.

Continuing the good tradition of encountering forums of communists with shock work, very high labor productivity and new labor successes, the collectives of the USSR

CSA Central Computer Center and Main Computer Center and the Moscow State Experimental Computer Maintenance Plant Soyuzschettekhnika of the USSR CSA assumed higher socialist obligations and joined in the competition for fulfilment ahead of schedule of the tasks of the concluding year and the Tenth Five-Year Plan. Their initiative was approved by the board of the USSR CSA and the presidium of the Central Committee of the Trade Union of Workers of State Institutions. The initiative of those collectives was supported by 1,084 collectives of computer centers and stations of the USSR CSA system and 2,674 sections, teams, bureaus and other subsections of the computer network. Obligations directed toward fulfilment of the tasks for two months of 1981 were assumed by 21,000 workers.

Questions of the further development of the automated system of state statistics are constantly at the center of attention of the USSR CSA management. In that connection it should be noted that the board of the USSR CSA at the end of 1980 discussed and approved the main directions of development of the automated system of state statistics. In them provision is made for the further development of automatic statistical data processing and the complex mechanization of bookkeeping in kolkhozes, sovkhozes, centralized bookkeeping budget institutions, cooperatives, etc. During development of the automated system of state statistics much attention will be given to the rayon unit and the introduction of new standard statistical data projects oriented toward modern hardware and a system processing technology.

It is proposed to develop the rayon level of the automated system of state statistics in several directions, in which provisions are being made to continue the creation of computer centers equipped with model M-5100 punched card computer complexes and smaller YeS computer models; to do experimental work on the equipping of several rayons with SM-4 computers and other modifications of the small machine system; to equip several rayons with developed subscriber point and communication channels with computer centers of oblast statistical administrations, the functioning of which will be accomplished with the work experience of already created shared multicomputer centers taken into consideration; to conduct in 2-3 rayons experimental work on the creation of rayon distributed computer systems.

In an experimental procedure it is planned to work on the compilation of statistical reports directly in a rayon computing and data processing center on the basis of the processing of bookkeeping data of enterprises and organizations of the rayon.

Machine data processing requires well-organized accounting at enterprises, construction sites, kolkhozes, sovkhozes and other organizations. Recently the USSR CSA, with the participation of ministries and departments and separate enterprises and organizations, developed and approved standard typical interdepartmental primary accounting forms for records of personnel, use of working time, calculations with blue and white collar workers of wages, fixed assets, raw materials, low-priced and rapidly worn-out objects, captial construction, motor-vehicle transportation, cash operations, inventory results, etc, obligatory for use by enterprises and organizations, regardless of the department they belong to. In addition, the USSR CSA has developed and issued standard forms for a number of other accounting purposes, on the basis of which the ministries and departments have approved standard primary accounting forms for subordinate enterprises and organizations. Corresponding standard forms have been approved by the USSR Ministry of Finances for budget organizations.

At the present time the ministries and departments are working on the introduction of standardized forms adapted to the requirements of mechanization into the accounting practice of enterprises and organizations. In the field organs of state statistics are helping in every way possible and rendering help to enterprises and organizations in that work. Attention is being given to the need to accelerate work on the development of multiple-user computer centers.

In the practical activity of the USSR CSA computer system the organized 29 multiple-user computer centers, as indicated above, assured processing of the 1979 All-Union Population Census Materials in time and on a high level. The multiple-user principle of data processing is used in a series of large one-time statistical projects. Multiple-user computer centers will be developed later in proportion to increase of the production and delivery to computer centers of the necessary means of data processing--computers, peripherals and means of communication.

Questions of the effective use of computer software deserve intensive study. The All-Union State Planning and Technological Institute for Mechanization of Accounting and Computer Work (VGPTI) has been made responsible for the introduction of software into the practice of accounting work in the country. The Institute does the standard planning of the mechanization and automation of the solution of bookkeeping tasks for enterprises and organizations of various ministries and departments. The Institute also faces the task of further improving the planning work in the area of the creation of intersector plans for the mechanization and automation of accounting work in the national economy.

To increase the effectiveness of application of standard software and eliminate duplication of work on the creation of software for the data processing of enterprises and organizations of the national economy, within the VGPTI a special subdivision has been formed for the organization and development of standard software, and its accompaniment and introduction.

It should be noted that a number of computer centers and stations still are not accomplishing the established planned tasks.

Questions of the transfer of computer centers to khozraschet require solution. In the Ministry of Railways, of Automobile Transport and a number of industrial ministries and in organs of state statistics all the computer centers have been transferred to khozraschet. However, in the national economy more than 75 percent of the computer centers and organizations having computers still do not use khozraschet. The further transfer of computer centers to khozraschet ought to contribute to an increase of the effectiveness of their work, increase of the loading of computers, increase of labor productivity and to putting wages and the bonus system in order. At the same time this question should be solved specifically for each computer center and station, depending on the achieved level of labor productivity, its organization and other factors.

Special attention must be given to the economical expenditure of punched cards, paper and other materials, and also to the introduction of hardware permitting computer centers to work without perforation by recording data on magnetic carriers. Such hardware (the YeS-9002 and YeS-9003 for YeS computers; the R-180 for the M-5000) has already begun to be used at computer centers.

The most important directions in the further work of the computer network of all collectives of computer centers and stations will be the improvement and development of mechanized and automated statistical data processing; the further improvement of the economic mechanism in the work of the computer system by assuring balancing of the production, economic and financial plans and plans for the supply of materials and equipment; a radical improvement of work on the complex mechanization of accounting in kolkhozes, sovkhozes, enterprises and organizations of the national economy on the basis of elevation of the planning level, the effectiveness of use of hardware and the quality of work; assurance of the accomplishment of planned tasks and socialist pledges by all computer centers and stations, the elimination of redundancy of their work, the implementation of measures to eliminate factors causing unsatisfactory work of various collectives; improvement of socialist competition, increase of its educational value for the creation of a creative situation in each collective, strengthening of labor discipline, innovator spirit and collectivism; the creation of better labor conditions in accordance with a complex plan for improving industrial hygiene and sanitary measures in organizations and enterprises of the USSR CSA system and improvement of worker living conditions.

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SELECTION OF DATA PREPARATION HARDWARE FOR RAYON NETWORK DATA PROCESSING CENTERS

Moscow VESTNIK STATISTIKI in Russian No 3, Mar 81 pp 63-65

[Article by V. Tankhilevich]

[Excerpt] The problem of organizing data preparation is extremely urgent for any computing and data processing center, as that part of the computing process, traditionally considered auxiliary, determines to a considerable degree the efficiency, quality and cost of work. Data registration on punched cards, however, widely used in the operation of perforator equipment, has a number of shortcomings under conditions of computer processing of economic information.

From the technological point of view the principal aspect of card punching consists in an absence of autonomous monitoring of data transfer to a machine carrier, which generates a chain of additional operations in verification and correction of errors. From the economic point of view this method involves extremely large expenditures of living labor, costly (and irrationally used) material of the carrier, machine time on input of the carrier into the computer and production space for its storage. Card punching is insufficiently effective also from the point of view of organization of labor: the equipment works unstably, there are few possibilities of automation and, what is less important, an extremely fractionated division of labor functions is characteristic of the perforation process.

Although the development of data preparation hardware occurred historically with some lag behind the improvement of computers which affected mainly the central equipment--the processor and storage, at present there exists data preparation hardware developed on a technical basis new in principle. The introduction of this hardware leads to radical changes in the technology and a considerable socio-economic effect. However, the cost of new data processing hardware is much higher than the cost of perforators, and so such replacement must be substantiated. The goal of the present article is to briefly generalize available information about new data processing hardware and to develop recommendations for their substantiated selection in the creation or reorganization of computing and data processing centers. In that case we orient ourselves toward computing and data processing centers of a rayon network, technically re-equipped on the basis of the M-6000 (M-5100) punched card computer complex.

The new equipment is divided into two classes: data preparation equipment [UPD] and systems [SPD]. These classes correspond to second and third generation devices, whereas punched card perforators belong to first generation data preparation hardware [1].

The following are characteristic features of data processing equipment: punched or magnetic tapes used as a machine carrier; the presence of an electronic control unit which automates auxiliary operations and monitoring; the presence of a small memory for program and data storage; the application of a symbol printer with data indication (more rarely, a display).

The following can be considered exceptional properties of data preparation systems: the presence of several operator panels, the independent functioning of which is achieved by means of a control minicomputer; the presence of a main memory with a capacity of 16-32 Kbytes; the application of magnetic type stores as output devices; developed software according to the type of universal computer operating systems; inclusion of line printing in the set of equipment.

In comparison with data preparation equipment multipanel machine controlled systems permit realizing qualitatively new possibilities: flexible and varied monitoring of data in the process of input and in the stage of storage of information in a buffer memory; monitoring the work of operators with the issuance to them of recommendations on error elimination; the consolidation and primary processing of file data, etc.

Table 1 presents a list of some data processing hardware of socialist countries.

The "Robotron-1370" is a characteristic example of data preparation equipment. Possible configurations of the complex can include in various combinations devices for output on punched tape, a cassette magnetic tape storage, devices for program input from magnetic tape, a digital indicator and a display. The macroprocessor realizes a set of logical, arithmetic and service operations. The permanent memory containing microprograms of instructions can have a capacity of up to 4 Kbytes. The main memory has a capacity of 1 Kbyte and is divided into 4 groups of 256 bytes each, from which the first and part of the zero group can be used for data storage. The modular structure of the processor permits expansion of the memory to 2 Kbytes. The presence of an order set considerably expands the possibilities of the equipment in comparison with the YeS-9002 data processing equipment, for example, which does not have a processor.

The presented data processing hardware, like any other, is provisional. With development the data processing equipment acquires some features of systems. Among promising devices is, for example, the YeS-9110 complex, which uses floppy magnetic disks as storage.

The first Soviet-made SPD-9000 data processing system is made up of six panels with the possibility of bringing their number to 32. An M-6000 complex with a main storage of 32 K 16-digit words is used as a minicomputer. The system dispatcher organizes the work of the operators, exchange between magnetic tape and magnetic disk storages and also primary processing of files. The software includes a supervisor, monitor and service modules and permits the solution of background tasks.

The architecture of the R-810 system, intended for data input on interchangeable magnetic disks, which are represented directly on the magnetic disk storages of the M-5000 complex, differs somewhat from the general scheme. The system has been simplified from the point of view of the structure of the control unit, through which a low cost of the system is achieved corresponding to the condition of use of

Table 1. Some second and third generation data processing hardware

Model	Type	Machine carrier	Number of working places	Country
EFM-446P	Electronic billing machine with perforator	Punched tape	1	USSR
Robotron-1375	Electronic data preparation equipment	Punched tape (also cassette magnetic tape)	1	GDR
YeS-9002	Data preparation equipment	Magnetic tape	1	PRB
YeS-9110	Complex of individual data preparation devices	Floppy magnetic disks	1-2	PRB CSSR
SPD-9000	Data preparation system	Magnetic tape	8-32	USSR
YeS-9003	Multipanel data preparation system	Magnetic tape	4-16	PRB USSR
YeS-9004	Group data preparation equipment	Magnetic tape	8-64	PRB
YeS-9006	Cassette data preparation system	Cassette magnetic tape	4-8	HPR
YeS-9150	Data preparation system	Magnetic tape	8-32	PPR
R-810	Data Preparation system	Magnetic disk	4-8	USSR

a small computer as a central computer. Of course, in that case the operating possibilities of the system have also been diminished.

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GEORGIAN SSR AUTOMATED AGRICULTURAL MANAGEMENT SYSTEM IMPLEMENTED

Tbilisi ZARYA VOSTOKA in Russian 4 Apr 81 p 2

[Article by G. Dzhavakhishvili, director of the computing center of the Georgian SSR Ministry of Agriculture: "First Steps for 'ASU-sel'khoz'"]

[Text] It is difficult to imagine further growth in the efficiency of the republic's agricultural production without extensive use of economic and mathematical methods and modern computers and office equipment. The time of traditional calculations manually with a pencil is becoming a thing of the past. Automation of the organizational and economic processes of agricultural production is making its own place more and more persistently. Its level is determined not only by the hardware base and capabilities of computers, but also by the principles of organization of the management system.

Of decisive importance here are: first, the purely organizational factors--the structure of the management agencies at the various heirarchic levels of agricultural production, the functional duties of the workers in these agencies, document turnover, the system for monitoring and follow-up, etc. Second, the economic mechanism--the systems of criteria of agricultural production, its evaluations and indicators, the principles for material and moral incentives for the workers, etc. The subjective factor, very important, also cannot be forgotten. Even if everything is set up right in the technical and organizational sense, but the necessity of an ASU has not been realized by the managers of agricultural production, things will not get moving. And an attempt to use a computer to fit the technology of planning, monitoring, analysis and decision-making that existed before the age of computers is the same as hitching a jet engine to a cart.

The problem of the problems of efficient management is the optimal distribution and specialization of agricultural production. Much attention was paid to it in the review report by the Central Committee of the Communist Party of Georgia to the 26th Congress of the republic's communist party. The task has been drawn quite clearly--the problems of optimal distribution, specialization and concentration of agriculture within each region by farms with regard to grouping of single-type farms, within zones by regions and within the republic by zones have to be worked out thoroughly.

In contrast to other sectors of the national economy, agricultural production has certain features--the same productive resources of soil, agricultural equipment, fertilizer, etc. are used for all types of agricultural produce. It is quite natural that the development of one subsector of agriculture affects the development of the other subsectors. Therefore, the solution to the problem of optimal distribution, specialization and concentration of agricultural production has to be approached not in an isolated way, in the profile of individual regions and subsectors, but comprehensively, considering all subsectors and regions at once in a single aggregate.

Along with structural unity, functional unity is also needed--an integrated approach to managing the organizational and economic processes of agricultural production. The broad range of problems of planning, accounting, monitoring, analysis and expeditious management of agricultural production has to be solved comprehensively. To put all these principles and aims into practice, the automated system for management of agriculture--"ASU-sel'khoz"--is now under development in the republic's Ministry of Agriculture. It provides for automation of the processes of organizational and economic activity at all heirarchic levels of management of the republic's agricultural production--from the agricultural enterprise (sovkhoz, kolkhoz) to the ministry as a whole.

An intermediate in the republic's "ASU-sel'khoz" is the automated system for management of the acquisition, transportation and delivery of grapes--"ASU-rtveli " which was successfully introduced in 1980 in eight regions of Kakheti. Putting the "ASU-rtveli" into operation in the Kaheti regions, as was noted in the review report by the Central Committee of the Communist Party of Georgia to the 26th Congress of the republic's communist party, can be considered the beginning of a new stage in the automated management of agricultural processes.

Analysis of the operation of the "ASU-rtveli" has shown that the economic effect obtained from its introduction exceeds 2 million rubles. How was this achieved? First, through substantial reduction in transportation expenses; the amount of transportation engaged in hauling grapes decreased 35-40 percent. Also having an effect is the increase in labor productivity by the pickers, and the improvement in quality of grapes delivered because the time between picking and delivery to the plant has been reduced. The 15-20 percent reduction in the length of the acquisition process itself is also of no little importance.

The technical basis of the "ASU-rtveli" is the regional dispatching system. It consists of a radiotelephone network linking the regional dispatching center with the agricultural enterprises (sovkhozes and kolkhozes), the wineries and the regional stations of the Gruzgoskomsel'khoztekhnika [Georgian State Committee for Agricultural Equipment]. The dispatching center has the equipment needed for local processing of arriving data and for systemization and storage of data on various media, and has a visual representation of the incoming data on the economic and organizational status of all the organizations involved in the harvest on well-defined status boards. This is where the regional staff operates that is established specially to organize the managerial processes of acquisition, transportation and delivery of the grape harvest.

The regional dispatch center operates in two modes. During operation in the first mode, data comes into the center on all disruptions to the requirements of the production regulations--trucks or grape processors out of operation, extension or reduction of the schedules for delivery of grapes to wineries. And during operation in the second mode, data comes in by previously coordinated format at a strictly specified time from the agricultural enterprises on the quantity of grapes not yet picked, the number of pickers needed for the next day, etc. Truck and tractor stations report the availability of trucks and tractors with trailers, and the wineries report the quantity of grapes delivered by each sovkhoz and kolkhoz by varieties and on the status of their production capacity.

This data is sent by teletype to the Tbilisi computing center. After processing by specific algorithms, the strategy is generated here for picking and hauling grapes for the next day, and the results of the competition for the previous day are summed up. All these results go back to the regional dispatching center. The strategy developed by the computer center is discussed in a staff meeting and refined if necessary; after this, it becomes mandatory and must be strictly executed.

Work is now underway to expand the "ASU-rtveli" in the ministry together with the Georgian branch of the All-Union Scientific Research Institute of Organization and Management Problems (GFVNIIPOU), Georgian State Committee for Agricultural Equipment and the computing center of the Georgian SSR Academy of Sciences. The task set is to unite all agricultural work in the region done throughout the year. There are also plans to set up similar systems for tea, fruit and vegetable growing. And in the future, all these systems functionally united with the sector ASU for the Ministry of Agriculture will form the basis for a unified automated system for management of agriculture--the republic's "ASU-sel'khoz."

But just as with any new project, this one has its share of problems and complications too. First, the unified data transmission network (YeSPD) is not yet operating in the republic, and the existing communications system is very unreliable. Second, an ASU cannot be set up without serious theoretical and methodological research both on the system as a whole (setting up a frame for the "ASU-sel'khoz"), and on the individual subsystems and groups of tasks. These problems, as we already noted above, must be solved in close coordination with the problems of improving the system of planning and the organizational structure of management of agriculture in the republic. And to achieve this, close contacts are extremely necessary between the ASU developers and the Georgian Scientific Research Institute of the Economics and Organization of Agriculture and with the other scientific research institutes under the republic's Ministry of Agriculture. There also has to be maximum utlization of the experience of establishing ASU's in the other republics, sectors and departments. And only this will bring success.

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INTRODUCTION OF AUTOMATED SYSTEMS IN THE RSFSR FINANCIAL AND INSURANCE ORGANS

Moscow FINANSY SSSR in Russian No 12, Dec 80 pp 52-58

[Article by B.I. Filimonov, director of the RSFSR Ministry of Finance computing and data processing center and candidate of economic sciences, and A.P. Kolesnik, candidate of technical sciences]

[Text] Further improvement in planning the country's national economy under present conditions calls for the extensive use of electronic computing equipment. The planned introduction of computer equipment and mathematical methods is being accomplished in the RSFSR through the creation of a republic automated system for collecting and processing data for calculating, planning and controlling the RSFSR economy; it is called the ASU-Rossiya. One of its integral parts is the automated system of the RSFSR Ministry of Finance, and its introduction in the financial and insurance organs is opening up great possibilities for improving the compilation and management of the budget, and also for handling insurance operations.

The automated system for management of financial calculations [ASFR] for the RSFSR will be based on the principles of the organization of financial relations within the national economy. Since it is an integral part of the ASU-Rossiya, it is at the same time one of the republic elements of the USSR Ministry of Finance's ASFR. In this way, within the automated system for financial calculations, in accordance with the structure of the financial system it is possible to single out a number of elements or levels: all-union, republic, oblast, rayon.

In the technical requirements for the ASFR confirmed by the USSR Ministry of Finance, the characteristics of the automated system common to all levels are indicated, and on the bases of analysis of them its functional structure containing the schedule of comprehensive tasks subject to planning and introduction is developed. The designations for most tasks for union, republic and oblast levels coincide. To a certain extent the designs for the same tasks developed for each of the levels also coincide, but they also have their own specific nature. The tasks designated for financial organs at the same level, for example, those for oblast financial departments, have even more in common. Frequently the difference between them lies not in the methodology and algorithms used but in the conditional-permanent data (the list of subordinate financial organs, lists of enterprises and so forth). This means that it is necessary on the one hand to plan ASFR tasks so that they can be used not only in the individual financial organ but also in all financial organs at a given level, and on the other, to develop them while taking into account the specific nature of the organ.

For the successful planning and introduction of tasks, and also for the organization and coordination of work on the RSFSR ASFR, since 1 January 1978 a computing and data processing center [IVTs] has been in operation. It is a computer center for collective use. Its function is to insure the introduction of mathematico-economic methods in the practical work of the apparatus of the ministry and the financial organs subordinate to it in order to improve methods for compiling the RSFSR State Budget and obtain immediate information essential for its compilation and for analysis of its execution. By an order of the RSFSR Ministry of Finance, the IVTs has been defined as the head organization in the development and introduction of automated systems in the ministry and the organs subordinate to it.

It is important to note that the formulation, planning and programming of tasks require constant and close contact between the IVTs staff and workers at the ministry administrations. This kind of contact is particularly essential when calculations are being made for production indicators for the administrations. Thanks to this, errors found in input data are eliminated, calculations results can be passed on immediately and so forth.

In 1978 the IVTs workers and workers from the ministry administrations defined the sequence for planning for the 10th and 11th five-year plans and did work to set up a data base, write the programs and draw up plans for the task complexes. In June 1978 the collegium of the RSFSR Ministry of Finance examined questions of a comprehensive program for the introduction of automated systems in the RSFSR financial and insurance organs, and noted a number of shortcomings in the introduction of computing equipment: slow planning for the ASFR tasks, the inadequate effectiveness of programming work and insufficient attention to questions of training personnel for computing centers and retraining the staff of financial organs for working with automated control systems [ASU]. This can lead to considerable difficulties when computer equipment is introduced and new methods are used. The technical base for the ASFR is poorly developed and no unified methodology has been drawn up for setting up the system.

Work on introducing automated systems in the financial organs is being set about inadequately. It should be particularly stressed that the latter are lagging considerably in these matters behind other sectors. This kind of work is being done only in the kray financial section in Krasnoyarsk and at the financial administration in Moscow. In particular, in Krasnoyarskiy Kray consolidated norms have been worked out on a computer for expenditures for the upkeep of social and cultural establishments and are used to compile budgets planned for rayons and cities; a consolidate annual account is being compiled for budget execution together with a summary of local budgets confirmed by local soviets; and budget allocations, immediate summaries on budget incomes and so forth have been made more precise. A YES-1022 computer has been brought on line at the computer center for financial and insurance organs in Gorkovskaya Oblast. Centers based on the type M-5000 computer have also been set up in Bryansk, Ulyanovsk, Novgorod, Abakan and Cheboksary.

Questions involving the disposition of computers and computer centers within the financial and insurance organs are being resolved slowly in the Tatarskaya ASSR and Volgogradskaya, Kuybyshevskaya, Novosibirskaya, Permskaya, Chelyabinskaya and other oblasts. Coordination of work on setting up computer centers in the financial and insurance organs remains inadequate. In the future this could lead to duplication of work and the dissipation of effort and equipment. It is economically expedient to set up computer centers in which the tasks of both the financial and the insurance organs of the oblast and rayon elements can be solved. Under these conditions it is possible to insure an adequate load and reliable functioning.

Taking into account the shortcomings noted, in order to further improve the introduction of computer equipment and to plan ASFR tasks, the collegium of the RSFSR Ministry of Finance has entrusted the coordination of work on setting up the ASFR to the computing and data processing center, and the coordination of planning and introduction tasks for the insurance organs to the Main Administration of the RSFSR State Insurance. In order to satisfy the requirements of the financial and insurance organs, the collegium has recommended that all measures on introducing the ASFR and computer equipment be carried out comprehensively.

The basic tasks facing the financial and insurance organs of the RSFSR in fulfilling the comprehensive program can be divided into four groups: development of the methodological bases of the ASFR and improving methods of financial calculations based on the use of mathematical methods; the creation of the technical base for the RSFSR Ministry of Finance automated system--the network of computer centers; training personnel for work in the financial and insurance organs of the RSFSR under conditions of automated systems; and the development and introduction of plans for the ASFR task complexes and automated systems for handling insurance operations. We shall examine each of these in more detail.

Developing the Methodological Bases of the ASFR and Improving Methods of Financial Calculations Based on the Use of Mathematical Methods.

From the viewpoint of methodology for setting up the automated system, it is first necessary to define its external links. These are dictated by the traditional links between financial organs and other organizations used for managing and exchanging information. In the future it is necessary to agree on a procedure for exchanging information between the computer centers in the RSFSR Ministry of Finance system and other ministries and departments using communications channels or machine carriers. It is essential to activate this work considerably and carry it out at all levels. In the final analysis, it should also lead to unification of systems within the ASU-Rossiya.

The links we have examined are called horizontal links. Setting them up assumes exchange of information between systems, but it is not limited to this. The organizations working on the various elements embraced by ASU-Rossiya should jointly set and solve the planning and management tasks inherent to the various ministries or administrations utilizing the same mathematical methods and models, and also tasks that require close cooperation between executive organs subordinate to given ministries.

Horizontal links must be developed primarily within the frame work of the ASFR, between the IVTs's of the union republic ministries of finance, and within the

RSFSR between the computer centers to the financial and insurance organs at oblast level. The leading role in the organization, coordination and development of these links belongs to the head organizations, namely the USSR Ministry of Finance main computer center, and within the RSFSR, the RSFSR Ministry of Finance IVTs.

A scientific and technical commission under the chairmanship of the USSR deputy minister of finance S.A. Sitaryan [as published] was set up in 1980 within the USSR Council of Ministers State Committee for Science and Technology. Its function is to control and coordinate work on integrating the automated systems of the financial and credit organs (the USSR Ministry of Finance, the USSR Gosbank and the USSR All-Union Bank for Financing Capital Investments [Stroybank]). The RSFSR Ministry of Finance IVTs proposed a plan to the commission that provides for the USSR Gosbank main computer center to receive via machine carriers data on the monthly cash returns for budget fulfillment at oblast level and for the RSFSR republic budget, together with figures on the funding of capital investments and other measures from the RSFSR republic budget. These figures are now received at the RSFSR Ministry of Finance in the form of computer printouts. It is proposed that figures on the fulfillment of the state plan for funding capital investments by the ministries and administrations of the RSFSR, along with the Stroybank and RSFSR Ministry of Finance calculation, be passed on from the USSR Stroybank using machine carriers.

The total volume of banking information required to solve a given task amounts to more than 52,000 indexes each month. As a result its processing in accordance with the computer plan should be formed of 158 input documents containing about 70,000 indexes. These documents contain, in particular, figures on the analysis of payments made into the union and republic budgets both for the RSFSR as a whole and by financial organs.

The technical plan for the complex being examined has been agreed with the Budget Administration, the State Revenues Administration, the Administration for Financing Trade and Monetary Circulation and the Administration for Financing Social Insurance.

The following will result from its realization: there will be a marked reduction in hand compilation of accounts on the fulfillment of all-union and republic (RSFSR) budgets; the analysis of budget fulfillment will be considerably expanded and its quality and immediacy will be enhanced; a data base will be created as the basis for even more complete analysis and planning. However, the effectiveness and immediacy of task solving will be achieved only when data are passed from the USSR Gosbank and the USSR Stroybank using machine carriers. Similar developments are underway at oblast level under the coordination of the RSFSR Ministry of Finance IVTs.

In accordance with the plan worked out at the IVTs for the computer centers of the financial and insurance organs in Gorkovskaya Oblast, material has been prepared for the technical plan for the task complex known as "On-line accounting and analysis of payments made to the budget from enterprises, establishments and organizations." In this complex, provision is made for obtaining data on payment of drafts from the oblast office of Gosbank, using machine carriers. These figures are at present processed in the computer center of the Gor'kiy Gosbank office but are not extracted via a machine carrier. It is proposed that the task of development and introduction be accomplished in stages. In the longer term, when it has been fully introduced about 3,000 payment draft documents (30,000 indexes) should be processed each day. Programming and introducing the task for this particular complex made sense only when the banking information is obtained via machine carriers.

An analysis of the possibility of exchanging information between the computer centers of Gosbank and the RSFSR Ministry of Finance has shown that it is technically feasible without additional capital investment or equipment. However, because of the different types of computers (the "Ural" type in Gosbank and the YES type in the Ministry of Finance computer center) data exchange can be effected only via punched tape. To accomplish this, it is necessary to work on a number of problems solved at the Gosbank computer center so as to provide an output facility for the data stored on the punched tape. The labor expenditure on this kind of work is insignificant compared with the effect of interaction between the automated systems.

Vertical links--between the different levels of the ASFR--can be regarded both from the viewpoint of controlling the creation and function of the ASFR itself and from the viewpoint of the transmission of data needed to solve tasks. It is obvious that a system as complex as the ASFR can be created and introduced only by dividing planning work between several executors and by the development of standard plans and their circulation and introduction in all the financial and insurance organs at a given level. This kind of organizational method calls for precision on the part of the coordinating organ and discipline among those carrying it out. In fact, for the RSFSR ASFR the ministry computing and data processing center fulfills the role of main computer center.

It is not proposed in the immediate future to create within the RSFSR financial system subunits that would develop and introduce the ASFR at the rayon level. This will be done by the computer centers of the financial and insurance organs for the autonomous republics, krays and oblasts of the RSFSR, and for Moscow and Leningrad.

It is proposed to set computer centers engaged in developing standard plans (base computing centers) in the cities of Gor'kiy, Bryansk, Krasnoyarsk and others. Planning subunits will not be set up at the other computer centers. They will merely adapt the standard plans to local conditions and introduce and operate ready tasks for the financial and insurance organs.

The development of annual plans and the acceptance of ready work (task plans, results from test operations and introduction and so forth) are milestone events in the coordinating activity of the computer centers for financial and insurance organs in the RSFSR. Both the plans and the final results of the activity of such computer centers should be confirmed by the leadership of the corresponding Ministry of Finance for the republic, kray or oblast financial section only after agreement with the head organization--the IVTs for the RSFSR Ministry of Finance. Centralization of planning and accountability makes it possible to eliminate duplication and to concentrate efforts on the most important sectors.

Methodological materials and systems documents (classifiers, inspection methods, the structure of the data base for the RSFSR ASFR, program packages and so forth) will also be distributed centrally.

During the third quarter of 1980, work should be completed in the RSFSR Ministry of Finance IVTs on the coordination plan for the planning and introduction of the ASFR in the RSFSR. Task complexes that will be processed as standard tasks with subsequent introduction in the operating computer centers have been spread among the base computing centers for the financial and insurance organs of the RSFSR. In particular, the computer center in Gor'kiy city will make projections for a state revenue unit in a subsystem for fulfilling the state budget, and the computer center at Krasnoyarsk will be engaged on task complexes for budget compilation and so forth. The tasks have been spread taking into account the experience gained by the financial organs and computing centers.

In the long term, the transmission of information vertically--between the computing center for the oblast level and the RSFSR Ministry of Finance IVTs--will be accomplished mainly via communications channels. Teleprinter communications can now insure the transmission of relatively small volumes of on-line data, and other documents are sent through the mail. An important event will be that in the future it is proposed to pass data not only in the regular form (on paper) but also via machine carriers, mostly on magnetic tape.

Magnetic tape carrying the large volumes of data required will be generated as the result of solving ASFR or State Insurance ASU tasks at the corresponding computing centers. In its turn, the RSFSR Ministry of Finance IVTs will transmit the required data via communications channels or machine carriers to the main computing center of the USSR Ministry of Finance. This will make it possible to considerably reduce costs and accelerate the solving of tasks since it will not require the manual transfer of data from documents in regular form onto machine carriers. As the ASFR is developed, similar methods will be introduced to transmit data from the financial organs at the rayon level to the oblast level.

A great deal needs to be done with respect to improving the methods of the financial calculations themselves. Although the first stage of the ASFR, for which the functional structure has been confirmed, is oriented toward the transfer of the existing manual methods of financial calculations to computers, even here an opportunity exists for using mathematico-economic methods and models. In particular, it is proposed to carry out the evaluation of expected fulfillment of the budget in terms of given indexes, and also the calculation of some of the indexes, using prediction methods and simulation modeling. Preliminary studies in this direction done at the RSFSR Ministry of Finance IVTs have given encouraging results.

The transfer to the computer should provide new stimulus to introducing the method of compiling low budgets with the use of base calculations based on consolidated indexes. This method has already been used for a number of years in Krasnoyarskiy Kray and this has made it possible to reduce the number of calculation indexes to 318; this figure includes reducing the number of indexes for peoples education establishment to 95, for cultural establishments to 38, for health establishments to 145, and for others to 40. As a result, the kray financial section has substantially reduced the amount of working time spent on examining rayon and city budgets.

The resolution of these tasks, however, requires the creation of data bases in which planning and accounting financial and insurance data is stored for a number of previous years. The accumulation of these data will make it possible to solve the task of data and reference services for the workers in financial and insurance organs. The fact is that programs for machine handling of base data can extract the significance of indexes in the most varied aggregates. This makes it possible to substantially facilitate and accelerate the preparation of references, tables, reports and other documents and to solve the problem of setting up archives and retrieval from them. The qualities of modern computers such as large storage and rapid retrieval of the required data are seen here.

The RSFSR State Insurance Main Administration and its administrations have to develop subsystems such as on-line planning and control, accounting, material and technical supply, long-range planning of insurance operations and so forth. The structure of this part of the State Insurance ASU corresponds in many ways to that of the ASU for the sector ministries and therefore it is considered possible and expedient to make use of their experience. Possibilities for further improvement in the methodology for financial calculations will become apparent during the process of creating and introducing the ASFR and the State Insurance ASU.

Creation of the Technical Base for the RSFSR Ministry of Finance Automated System--the Network of Computer Centers.

The collegium of the RSFSR Ministry of Finance has confirmed a plan for the commissioning of computers in the financial and insurance organs of the RSFSR for the period 1978-1985. In accordance with this plan, which is part of the comprehensive program, it is intended to organize computing centers for financial and insurance organs in the autonomous republics, krays and oblasts of the RSFSR; the computer centers will be based on YES and M-5000 computers. The choice of the type of computer is made in accordance with the volume of data that needs to be processed.

One important problem is the siting of the computing centers, and it is to this that the attention of the leaders of financial and insurance organs at the local level should turn. This applies in particular to places where it is proposed to use the YES computer since, as a rule, it is intended first to install one machine and a second later. It is not economically expedient to locate them in separate premises since this requires additional maintenance staff.

In accordance with the technical specification "Requirements for premises and air conditioning systems" Ts 50.170.008.TO., floor space of about 100 square meters is required for one YES-1022 computer, and 200 square meters for two. Ceiling heights for premises earmarked to house the computers should be at least 3.6 meters. In addition to the computer itself, a computer center must also have machine data-preparation devices, air conditioning systems, automatic gas, fire extinguishers and power supplies. All these things should be planned before the construction part of a project is initiated. In this way, planning work can be done in four to six months less time.

In those autonomous republics, krays and oblasts where it is intended to use the M-5000 computer, premises for its installation can be considerably smaller--about 50 square meters for one machine and 75 square meters for two. In addition, assembly and installation and planning for the premises are simple. In order to eliminate holdups in starting up computers, they are being delivered only when the premises are ready for their installation.

It is intended to equip the RSFSR Ministry of Finance computing and data processing center with computers of moderate power (YES-1033 or similar). In addition, a Realite-20 minicomputer has already been installed there. This is a compact French machine with a 50-million-symbol (sign) storage capacity on interchangeable disks, and a magnetic-tape device and printer. Its advantage lies in the fact that it can insure the simultaneous operation of up to 32 satellite stations. A satellite station is an alphanumeric output device that presents data on a CRT display and also has a keyboard for inputting data. A programmer or ministry worker can work at a station quite independently, working on his own program in his own office.

It is intended that this computer will be used to handle a data-reference system that will provide ministries workers with the possibility of rapid access to planning and accounting data for a number of years (data base). They will have no need to write the job and pass it to the IVTs operator who must then run the necessary programs and make hardcopies of the results of the request. The entire procedure will be automated. The ministry worker at the satellite station keyboard set up in the administration merely punches in the request in the appropriate form and in a short time the data he needs will be presented on the satellite station display. Hard copies can also be made if requested.

During the first quarter of 1980, the computing and data processing center passed to the RSFSR Ministry of Finance Budget Administration a task complex for computing mutual accounts between budgets handled on the Realite-20, ready for industrial application. This complex makes it possible to automate the processing of notices, letters and authorities for payments connected with mutual accounts between budgets. The computer automatically furnishes the account card for mutual accounts with each of the 73 local budgets and the all-union budget, together with feedback information on mutual accounts with local budgets and addenda. As it is received, data on notices is inputted to the computer from the satellite station keyboard in interactive mode, and output documents can be printed for any required date. The introduction of this complex has made it possible to eliminate manual handling of the cards for mutual accounts and to enhance the immediacy and accuracy of this data.

By the end of 1980 it is proposed to expand the task complex for mutual accounting between budgets to print notices automatically for the financial organs and to obtain journal orders. In the process of development, task complexes are also being found for the state revenues administration, the administration for financing industry, central bookkeeping, the RSFSR State Insurance Main Administration, the Chancellory and other ministry subdepartments.

Naturally, financial calculations will also be handled on the Realite-20, in particular tasks connected with budget changes, multiple-variant computation and so forth. The Realite-20 will be hooked up with the YES computer installed at the IVTs and form with it a single computing system with a common data base. The YES computer will add to the data base in the process of burst-mode handling of data prepared for machine carriers. It will be most expedient to use it to solve tasks with a large periodicity for accounting (once a year, once a quarter and so forth) and with considerable amounts of input data.

Training Personnel for Work in the Financial and Insurance Organs of the RSFSR Under Conditions of Automated Systems.

On instructions from the collegium, within the RSFSR Ministry of Finance a plan has been developed and confirmed for training personnel for work under the conditions of automated systems. It covers two topics: training computer center personnel, and retraining workers in financial and insurance organs for work under conditions of automated systems. As far as specialists such as electronics experts, mathematicians and programmers are concerned, they are trained in quite large numbers at VUZ's. The plan provides for timely requests to the RSFSR Gosplan to direct them into the RSFSR Ministry of Finance system.

At the computer centers, however, specialists with a good training in the financial field and at the same time possessing the knowledge essential for computer applications and the creation of ASU's will play a quite substantial role. It is expedient to train these specialists at economics institutes and at specialized secondary institutes, including courses on computer science and the ASFR in the training schedule. This task is quite complex and requires a great deal of work and considerable time, but it can and must be solved for the successful creation of the ASFR on the scales envisaged by the collegium. The question of providing personnel for the computer centers should be largely resolved by the financial organs themselves since they are located in large cities where there are higher and secondary training establishments that train specialists in the required discipline. Establishing close contacts with them and creating good working conditions for young specialists are essential prerequisites for solving the personnel problem for the ASFR.

With regard to tasks of training these personnel for work in the financial and insurance organs themselves, this will be accomplished through the flow of specialists from the economics training establishments, where they will study computer science and the ASFR, and also through the retraining of their own workers. It is intended to conduct retraining at course bases within the RSFSR Ministry of Finance system. For this, provision has been made for the development of training programs, systems of rules and training grants. Additionally, meetings will be organized for workers in the computer centers of the financial organs to exchange experience in the creation and introduction of the ASFR.

Development and Introduction of Plans for the ASFR Task Complexes and the State Insurance ASU.

The functional structure confirmed for the ASFR contains a listing of the task complexes (financial calculations) that have been planned for introduction for the first stage of the system. Task complexes are grouped in blocks according to the designation of the indexes computed in them. For example, there is a block for consolidating and analyzing accountability for budget fulfillment that contains individual task complexes for consolidation and analysis of monthly, quarterly and annual accountability. Task complexes for state revenues and other blocks in the functional structure are similarly grouped. Thus, the division of the blocks and task complexes largely corresponds to the structure that has been developed in the financial organs and the procedures for utilizing the indexes obtained for calculations.

Experience in planning task complexes for the ASFR, however, shows that it is not expedient to keep this kind of division when transferring to the development of the software. First, writing a separate program with its mass of data (files) for each task complex causes considerable difficulty in transmitting data from one complex to another, and requires additional expenditure on the programming for these operations. Second, in each complex, the input operations for data, data control, and the printing of output documents are programmed for each task. Third, even task complexes belonging to different blocks can contain the same algorithms for computing indexes. For example, algorithms for consolidating indexes and constructing analytical tables largely coincide for all task complexes in the block for consolidating and analyzing accountability and budget fulfillment, a number of complexes in the block for budget consolidation, some of the complexes in the block for state revenues and so forth.

The situation is similar with algorithms for evaluating expected budget fulfillment according to various indexes. This evaluation should be made using mathematical models that coincide for a number of indexes. The algorithms and programs will likewise coincide. These complexes will differ only in respect of input data and the form of input and output documents.

In accordance with present requirements, the RSFSR Ministry of Finance IVTs uses a different systems approach in planning; in accordance with this approach it is necessary to plan a unified data base for all task complexes. Each complex reads its own input data from the base and writes the results to the same location. This solves the problem of transmitting data from one complex to another and simplifies and standardizes the planning process. Later, universal programmed modules will be developed (or existing programs will be used) to input and monitor data and also to produce hardcopy documents. They will be used in each task complex regardless of the block in which they are located. In addition, as a result of analysis of all complexes, coinciding algorithms will be singled out and programmed modules will be developed for them. From such models, a program will be written that corresponds to the algorithm for any given task complex. This method is aimed at reducing expenditures on planning and programming and reducing the time taken to introduce ASFR tasks.

Standardizing plans and introducing them in all financial organs, and the need to transmit data between computer centers at different levels require a unified data base. The RSFSR Ministry of Finance IVTs will therefore introduce the data base developed there in all financial organ oblast level computer centers. Later, it will be improved jointly with these computer centers in the process of operation and the accumulation of planning experience.

One important matter in the creation and introduction of the ASFR and the State Insurance ASU is unifying financial and insurance documentation and adapting it for machine processing. It is proposed to solve this problem in two ways. In the process of the joint operation of the computer centers and the apparatus of the financial and insurance organs, proposals will be drawn up for the unification and standardization of document forms, starting with those used most frequently.

Unification of document circulation for automated processing presupposes the following: compilation of a single designation dictionary for indexes and their tags; development of a unified classification of all indexes encountered in documents; development of a storage system and the control of classifiers and permanent data about documents in the computer memory; improvements in the form of documents for the purpose of ordering their structure and index designators and including them in the attribute documents required for machine processing (index codes and so forth); the exclusion of duplication of indexes in input documents and others.

It is proposed that work on unifying the form of documents be done jointly by the USSR Ministry of Finance main computer center and Scientific Research Finance Institute and proposals be presented to the USSR Ministry of Finance for final examination and confirmation. On the other hand, software for the ASFR is being developed in a way that will make it possible to make it depend as little as possible on the form of the documents. When the form is changed, input data for the programs are changed, but the programs remain unchanged. This makes it possible to plan and introduce ASFR tasks without waiting for completion of work on the new forms by using existing forms. The transfer to the new forms will not require changes in the programs.

For communication with other systems (Gosbank, the Central Statistical Administration) it is intended to draft temporary programs that insure compatibility in the format of data passed from system to system, since the demand for unity of the data base for different systems is difficult to accomplish. When plans for task complexes are introduced it is necessary to give a great deal of attention to the correct organization of this process. It is essential to set up the schedule for the arrival of input documents and their transfer to a machine medium in such a way that there will be no operator overload in data preparation. The entire technology for solving a given complex should be carefully analyzed and worked out at the stage of experimental operation. Here the possibility is not excluded that during the switch-over to the computer the time taken for some financial calculations will not be reduced compared with manual processing. However, this may be necessary in order to create and maintain the data base essential for such tasks. Here, the gain in time and costs for the calculations will be created in other tasks.

The functional structure of the ASFR should be further developed during the transfer to the second stage in work done under the leadership of the USSR Ministry of Finance main computer center and Scientific Research Finance Institute. With respect to planning for the sector ASU for the RSFSR Ministry of Finance State Insurance, here the work must be done from the very start, from the technical specification. However, in this case, all the principles of the systems approach are justified. In order to plan the ASU for State Insurance, within the IVTs a special department is being organized which will make maximum use of the systems work done for the ASFR.

The creation of the computer centers and their successful operation will depend largely on the acticity of the leadership in the financial and insurance organs at the local level in implementing the measures determined by the RSFSR Ministry of Finance collegium when confirming the comprehensive program for the development of the ASFR for the period 1978-1985.

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MOSCOW'S NEW AIR TRAFFIC CONTROL CENTER

Moscow VOZDUSHNYY TRANSPORT in Russian 16 Apr 81 pp 1, 3

[Article by S. Omelchenko and V. Torishniy, correspondents: "All Seeing Eye of the System"]

> [Excerpts] Important event: Aeroflot aircraft have begun to receive commands from the air controllers of the new Moscow Automated Air Traffic Control Center over an enormous territory of 700,000 square kilometers.

It was only recently that all control of air traffic of the three largest regions was concentrated in the operational hall of the Moscow Automated Air Traffic Control Center. The subdued lighting, the entire situation in the hall, designed to create an atmosphere of calm cooperative labor, cannot even begin to conceal the carefully hidden, but nevertheless, noticeable emotion of the participants. The joke is told: a road long in years leads to these minutes.

The center's coming to life was preceded by enormous labor in the design, construction, complex testing, mastery and training of the servicing specialists of the Moscow Transport Administration and the Scientific and Experimental Center for the Automation of Air Traffic Control, the Capital Construction Administration, the Central Radiotechnical Equipment and Communications Exploitation Administration, the Main Administration for Orders of Series-Produced Aviation and Ground Equipment, the State Planning and Surveying and Scientific Research Institute "Aeroproyekt" and the organizations of other ministries and departments.

The Computer's Melody

The squat building, rising at the edge of the Vnukovo Airport complex, even from afar creates an impression of something unusual. It may be because it has none of the usual alternating entrances and windows and maybe because the fan blades of an air intake device can be glimpsed fleetingly on the roof. In any case, it is not simply a certain architectural refinement, but a strictly functional circumstance caused by the function of the structure. It is literally the beginning of all sorts of electronic equipment. In the gallery, which is so long it could be used for track and field athletics training, the silence is not broken by even the squeak of a door. Everything here is subordinate to a common goal--

the creation of ideal conditions for air traffic control. Even the strict duty officer at the entrance who warns everyone trying to go inside wearing outer clothing. This measure is caused by necessity. The electronic insides of the instruments used in the Moscow Center are so sensitive that even a minimal disruption of the parameters of the microclimate is capable of negatively impacting on their operation. The air which enters the spaces of the center passes through an entire cycle of preliminary processing. It is filtered and humidified and special sensors continuously monitor its condition.

--When someone smokes in this room or spills some sort of runny liquid on the floor--says the representative of the system engineers group, Aleksandr Khabarov--the equipment immediately senses this. Just look: a mass of information is digitally stored on these magnetic disks. To the uninitiated a comparison with a record player arises. Yes, in rough approximation, it is similar. With the only difference that the "melody" carries data on the schedules of aircraft traffic and on the rules of its separation in the air, and on what actions the computer directs the other equipment to take in the case of an extreme or simply a complex situation. All of this is the result of the work of many specialists. There is program software. And in it, graphically expressed, the system brain is concentrated, without which none of the equipment which we saw is capable of assisting the controller.

The movement of large and small aircraft is controlled by the specialists of the air traffic control center from take-off to landing, providing traffic safety in the air. The fifth ocean is becoming crowded--in the last several years alone, new high-speed aircraft have entered the routes, the demand for air transport is increasing and its volume has grown. It is becomming ever more complex for the air traffic controllers. True, equipment assists them. In this very same Moscow zone, where approximately 60 airplanes pass through the sector in an hour, the most modern radars are installed. But, even just yesterday the air traffic controller specialists who work here were forced to direct approximately half of the aircraft coming into the airports of the capital to circle. Even working to the maximum of the capabilities, qualified controllers were simply unable to analyze the situation and to make the optimal decision which would have provided direct descent of all the aircraft into a landing with absolute and unconditional safety.

Who Helps the Controller?

Elementary arithmetic calculation shows that there are many more specialists assigned to provide uninterrupted operation among the personnel of the Moscow Automated Air Traffic Control Center than controllers. But this is understandable. The controller is the main figure. Order on the air routes depends on his knowledge, experience and reaction speed. But in order to free him from routine operations and to make it possible for him to completely dedicate his time to his direct responsibilities, the engineer-technician group must maintain the equipment at a level which is embeded in the design oy the requirements of life itself.

Yuriy Zaselskiy, the senior engineer of the communications service of the Moscow Automated Air Traffic Control Center told how his colleagues trained for the responsible moment of the opening of the center. A multitude of documents were read--instructions, recommendations, special books and publications. Many times the engineers and technicians had to be driven from their work positions in the literal sense of the word. Their work was so fascinating, not to mention responsible. And why was that? It is a clear matter that the development is attendant with the greatest difficulties, but that which faces the personnel in the exploitation process of the center can in no way be called a simple matter. The responsibility for all the data transmission channels lies on the service, as well as loudspeaker communications, land line communications and radio communications.

And today, it seems that the simplest actions of the communications specialists served as the final feature which put the controllers on the air at the moment of the opening of the center. Zaselskiy forced the plugs which sparked over the contact and the loudspeaker communications was in operation, somewhere at another point specialists connected previously disconnected terminals and the center obtained the capability of receiving radar signals, translated by computers into a language which may be used in operation, and then came the controllers.

So that the controller may guide the movement of the aircraft without interference--the senior scientific co-worker of the Scientific and Experimental Center of Automated Air Traffic Control, Aleksandr Stulov says--the technology of its activity must be adjusted to the finest details. Our section, which is headed by Anatoliy Fedorovich Petisov, accomplished enormous works in this direction. We participated in the design of the center, in the system acceptance from the manufacturers and in the compilation of the appropriate instructions. The last test of system operation was also the responsibility of the workers of our section. The crews of the technical testing panel must accept this responsibility in the future.

Today the complex automation of the air traffic control processes made it possible to increase the throughput of the Moscow Zone, the on-time scheduling of flights and their safety.

This is achieved thanks to the automation of the processes of collection and processing of radar information and information on the flight plans with the help of the latest computer and its presentation to the controllers on indicator screens, installed at the work positions.

The controller now has at his disposal a sufficient time reserve to solve control questions.

Regional (route) and air center automated systems are included in the Moscow Automated Air Traffic Control Center. The first provides control of the movement of large aircraft in the routes and outside routes within a region with a total area of 700,000 square kilometers, which includes the former territory of the Gor'kiy, the Voronezh and the Vnukovo regional centers. The radars create a continuous zone of radar coverage in the boundaries of the controller region above altitudes of 3,000 meters. Dual and triple radar overlap is provided over the basic part of the region. If one of the radars breaks down, the automated system, without interruption, will begin to process information from another radar.

A flow organization group is created for the first time in our country in the Moscow Center, whose task is to model the aerial situation in the Moscow Zone. The specialists of the group must regulate aircraft movement during work with the schedule and the flight plans.

Automation of the aircraft movement control processes is being conducted in our country according to a plan developed and approved way back in 1972. Automated systems in the airports in Mineralnye Vody, in Leningrad and in Kiev speak well for this. They were first introduced in the regions with the greatest traffic load.

The means of automation noticeably facilitate man's labor. But automation presents increased requirements on the training level of the specialists. Training programs are especially developed for them. Practice in system trainers, including the trainer in the Moscow Automated Air Traffic Control Center, assists the controllers in developing the required skills.

Several chairs, placed in a row in front of the indicators and the electronic control panel, are the work position of the organizational group which is headed by the senior engineer Viktor Tishkin. If a fault arises on any of the controller panels, the controller shift engineers may, without moving, conduct a most hair-splitting inspection. That is, they may examine in detail the "picture" in the malfunctioning indicator, explain the cause of the breakdown and transfer the controller's work to a spare control panel.

But today nothing of the sort happened. The Moscow Automated Air Traffic Control Center began operation exactly on time.

Today our country is developing new airport, air filter center and enroute automated systems which are planned to be introduced in the territory of the Northern Caucasus, the Leningrad and the Ukrainian Administrations. The controllers of the Privolga Administration (the Kurumoch Airport) and the Simferopol Airport will receive the new equipment for air traffic control in this five-year plan.

The future will see the complete automation of a complex and critical sector of the work of civil aviation--air traffic control.

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REAL SITUATION WITH PRACTICAL USE OF MATHEMATICAL ECONOMIC MODELS STUDIED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 2, Feb 81 pp 105-113

[Article by L. G. Golub, candidate of technical sciences, Scientific Research Institute of Construction of Estonian SSR Gosplan, Tallinn: "The Mathematical Economic Model — the Stages of Its Life"]

[Text] It has become an indisputable truth in scientific circles that a complex production process cannot be controlled without mathematics and computers. The manager needs an assistant who is able to store, sort, select, and produce the necessary information in a convenient form for decision-making. In the best case this electronic assistant selects the one optimal solution from the set of permissible solutions; in the worst case it selects several that are close to optimal.

Most practical workers agree with this entirely. If we examine reports on the introduction of mathematical methods and computer technology and setting up automated control systems, the situation is entirely satisfactory and even shows a certain tendency toward improvement. Scientific institutions are developing more and more mathematical economic models and reports of developmental projects generally end with an affidavit of introduction.

But if we look more closely, the situation is by no means so optimistic. It could be called the "starting point of the computer cult."

Virtually all large industrial enterprises and construction associations today have their own information-computing centers. The employees of these centers make up the bulk of the members of this "cult." They interact with a kind of mysterious object, the electronic computer, and report to the masses, to those for whom all this has been built (the managers of the enterprises, shops, and divisions, in short the users) on the results of their calculations, the machine's revelations. The users can be divided into three groups: enthusiastic believers; militant unbelievers; and, those who carry out the ritual formalistically.

Members of the first group often try to apply what they receive from the computer in practice, believing in the value of machine decisions. Members of the second group will not touch machine documents on principle, while members of the third group create the false impression that they are using them. The latter are the largest group and the one that the authors of the models like best because representatives of this group sign the corresponding certificates and affidavits almost without looking, whereas the members of the first group find it hard to sign them because they are striving for truly effective use of the models, and it is better not to approach members of the second group. Unfortunately, at the present time the first group is quite small and members of the second group, to avoid getting into unnecessary trouble, limit themselves to "grumbling in the halls." But the last group is simply terrifying, terrifying because of their indifference.

For the sake of fairness I should observe that in many cases there is reason for this indifference: the hopes which were held for mathematical methods and computers in the field of production control are far from being fully realized. There are many objective and subjective reasons for this situation. Let us consider a few of them. Let us trace the process of the birth, life, and frequently the death of models designed for use in production control.

The cross of creating these models is usually borne by sectorial scientific research institutes, planning-design organizations in the field of automated control systems, and information-computing centers. After the decision is made to formulate planning models, a line is inserted in the plan of the corresponding collective saying: develop and introduce. The time is usually one or two, possibly three years. And when there is a plan, there will also be a certificate of its fulfillment.

Many developers of models consider their approach entirely normal and draw up an appropriate schedule of jobs to fit the plan: study of the object to be modeled — N_1 months; development of the algorithm — N_2 months; writing computer programs — N_3 months; experimental testing — N_4 months, and finally, turning the model over for industrial use in a certain quarter. When N_1, N_2, N_3, and N_4 must be substantiated for planning agencies, in most cases the developers argue that the production sector for which the model is being developed is completely unique, that an original model which takes into account all the intricate specific features of the object to be modeled must be developed for it in particular. This approach makes it possible to support an increase in the length of work by one or two, and sometimes even several, quarters.

But the approach which contemplates introduction immediately after development promises significant losses, because it is out of step with what happens in reality. Let us take construction for an example.

In 1970 a very highly qualified work, commissioned by the Standing Commission of CEMA on Construction, was published under the title "Recommendations on the Application in Construction of Techniques, Algorithms, and Programs Developed in the CEMA Countries To Solve Multisystem and Multipurpose Problems with Due Regard for Rational Use of Resources." The work essentially collected, analyzed, and compared models designed for calendar planning of construction work. Of the 22 models considered 10 were Soviet. Almost 10 years later, when the questions of establishing standard planning concepts for automated control systems for calendar planning were reviewed, it was found that only two of all these models had received any significant practical application.

A sad fate took practically all of the models whose developers had, in the first stage, formally turned them over for industrial operation and stopped supervising the practical use of the results of machine calculations. Organizations using the techniques of automated planning calculations based on mathematical models usually form small groups of specialists within the administration, and these groups are responsible for the application of these techniques. But the duties of the groups in reality include nothing more than insuring that calculations are made by computer at the right time. Thus, on the one hand the model itself is not yet suitable for producing the decisions that are being carried out (the authors of the models often do not know this or do not want to know it), while on the other hand the administrative apparatus has people whose entire job is simply to perform calculations using this model.

Because the specialists for whom the calculations are performed do not use the results of the calculations, although they affirm officially that they rely on modeling methods in developing and reaching decisions, the calculations gradually become more predictable and people switch to other work while the model dies a slow, unnoticed death. The authors of the models are inclined to blame the production workers for this, charging them with being uninterested in applying the techniques of scientific management and an inability and lack of desire to prepare high-quality raw data. On this basis they spread the myth of the psychological barrier. But outwardly the results of modeling often seem quite effective. The users receive various kinds of information-packed and impressively packaged documents. Because only the representatives of production organizations are blamed for failure to use the results of modeling, the defects within the information itself, of which the production workers are intuitively aware, remain unidentified. Thus, we cannot ignore the conclusion that the model for control of a complex production process, after it has been composed, is not yet a model suitable for production use.

I would like to re-emphasize that I am not talking about a certain polishing and adaptation of the model to actual production conditions. I am referring to an independent and extended cycle of research, and the tool to be used in this research is the model that has been composed. In view of what has been said, the statute on planning development work of this type should be modified. Instead of introduction immediately after development, plans must provide for work to investigate the modeled object using the already-composed model and reworking of the model on the basis of scientific data received.

We analyzed one of our own models and found that the first stage of its life is essentially the first approximation to practice which permits no more than a familiarization, not speculative but based on experience of course, of the processes being described. Practical use of the model in this stage is nothing but an illusion. The first stage is not a matter of months and quarters, but rather years. Its length depends on the complexity of the processes being modeled. We ourselves involuntarily misled the user in this stage when we talked to him about introduction of the model in production. We knew that many mathematical subtleties which had been very hard for us were simply unnecessary in practice. We began to understand the full complexity of the apparent simplicity of real control processes. Over the course of several years, comparing the model against reality day after day, we developed a new view of our model and gradually revised it. By the time it was suitable for introduction in production, the only thing remaining from the prototype was, perhaps, the name.

Why is it, when we are used to the fact that debugging a machine program takes at least as much time as the programming itself and that start-up and adjustment work at a newly constructed enterprise often takes longer than the process of equipment installation itself, that we think a model for control of a complex production process can be made adequate to real conditions in a much shorter time than was needed to formulate it? Incidentally, while using the model to acquire scientific knowledge about the object being modeled, we reported that the model was in operation in practice. We did not even understand for a long time that we were only finding out about the object, not using the model for production needs. Important practical conclusions follow from this. After a model has been put into use in production it must be studied continuously for many years. Revision of the model to make it suitable for practical use is the second stage in creating a model.

We also came to understand another problem typical of control of construction work. We learned that our model could not be a mathematical object. Certain of its elements were mathematical objects, as were certain of its procedures. But overall the model was not a mathematical object. The point is that it proved impossible in principle to formalize the criteria of functioning of a construction organization. It is not just a matter of multiple criteria. The problem is that the goals, which also means the criteria, take shape during the process of planning as the production and economic situation taking shape is understood and recognized better. Such formulation of goals and selection of criteria is creative work that must be done by a human being. Therefore, the human being is an inalienable part of the model, and we learned that we were not dealing with a purely mathematical object.

Revising the model considering the human role in it gave us the illusion that by going through the second stage, having developed a model suitable for industrial use, we had finally solved our problem and accomplished our primary goal. But this proved to be untrue. We worked out the mathematical part of the model, but we did not prepare its crucial elements: a human being capable of working with the model and, essentially, becoming an element of it. Thus the third stage began, the stage of creating a model suitable to train a person.

In a complex model the connections between input and output parameters are not obvious. A change in input parameters causes not only desirable changes in the results of modeling, but also often has undesirable consequences. A person working with the model must have a sense of what the changes he makes in formulation of the problem may lead to. This is not easy to learn, and not all people can be taught it.

Experience with the use of models for calendar planning of construction and installation work at trusts of Glavkrasnoyarskstroy [Main Administration for Construction in Krasnoyarskiy Kray] has demonstrated that a well-trained specialist can arrive at an acceptable plan variant in three or four iterations, even under poor planning conditions. At the same time, a less well qualified specialist takes 6-8 iterations to solve the problem, even under better conditions.

The development of a model designed for teaching proved far from simple. The process divided itself into stages: building a trainer and working out a practical game. We still do not have a real practical game; it is just being developed. But the trainer, which models specific features of production economic activity at six real sites, is already in operation. The computer can shape a variation of the annual plan for such a hypothetical trust in a few minutes. By changing various parameters related to formulation of the problem such as the level of resources, priority of sites, and scheduled introduction time, the trainee can observe what effect these changes have on the final results of the trust's operations.

After the model had gone through all the stages of development and the workers involved with using it had been trained, there were still numerous problems to solve in order to use mathematical economic methods efficiently in production control. One of these problems was organizing the use of modeling results in practical management work. It is precisely here that the life of the model really begins.

What does it mean to use the results of machine calculations? One important construction manager said, "If the foreman or brigade leader at the construction site takes a machine-produced document out of his pocket this means that the system has been introduced; if he doesn't, the whole introduction is a sham." Of course, when we are speaking of weekly and daily planning this manager is correct. For many reasons, however, in particular the difficulty of obtaining reliable information for small time intervals, the dispersion of construction sites, and other factors, it is advisable to make automation of weekly and daily planning in construction the last thing done. The use of mathematical economic models can have the greatest impact in the stages of medium-range, current, and quarterly planning. And here we must make it very clear what introduction means.

Assume that an annual calendar plan of work for the trust has been written. This plan supports performance of the principal state assignments and takes the real capacities of the performers into account. This is the ideal case. The plan has been ratified by the manager. On the basis of the plan requests for resources, proposals for the work of subcontracting organizations, and requirements of the customer are formulated. All these requests, suggestions, and requirements are distributed to the appropriate organizations, services, and subdivisions. After a time the supply workers report that steel construction elements for the frame of the shop, for example, will come a month late, that reinforced concrete for the school will be a quarter early, that no reinforced concrete at all will be manufactured for the store in this year, that they will not provide pipe for five sites, that slate must be substituted for aluminum, and so on and so forth. The customers report delays in the delivery of equipment and the subcontractors request a change in the completion times of projects under installation. This is the beginning of real construction work.

Planning moves to the quarterly stage. The yearly schedule is now virtually ignored; from it they take the scheduled introduction times and, possibly, a few intermediate times. We must ask, can it be said that modeling has been introduced on the annual level? It is good if quarterly planning and then monthly planning is done on this basis. In this case the very continuity of planning sustains the life of the model. But what if automated planning is used only in one stage?

One often hears the opinion that if workers did not in fact follow the plan, this means that it was not introduced. But, they will not work strictly according to the quarterly plan or the monthly plan; actual working conditions make corrections in them. Our research has shown that if the performance of each particular job is analyzed, the realization of monthly plans even is about 60-70 percent, whereas the performance of aggregated indicators is very close to 110 percent.

It seems to us that if all the basic problems for which the plan is designed are solved on the basis of a plan composed with the help of a model, for example if an order for resources and mechanisms is written up, then the introduction can be considered successful.

One of the calculations made on the basis of our mathematical economic model of calendar planning for construction and installation work had an interesting fate. I am referring to the development of a comprehensive schedule for planning, supporting, and building a very large project, the Krasnoyarsk Heavy-Duty Excavator Plant. The general contractor of the construction project Glavkrasnoyarskstroy and the planners and customers decided in the early stages of planning to make up a schedule for the period covering construction of the first phase of the enterprise, which was almost five years. Leading specialists from the main administration and the chief engineer of the project worked out a set of critical path models for particular buildings and structures. They used standard parts of systems and entire systems in addition to individual models. Workers from the main administration's control system planning and design bureau designed and programmed a set of output documents. The computer figured more than 10 alternative schedules, one of which was chosen as best meeting all requirements. This alternative was ratified by the heads of three ministries, the ministries of the customer, the general contractor, and the chief subcontractor. The writing and ratification of the schedule opened the way to a scientifically substantiated solution to many construction problems related to financing, designing, supplying equipment and materials, and organizing the construction of the project. The schedule also helped solve many tactical problems

It is obvious that because many of the concepts contained in the initial data for modeling are based on expert estimates, as the design of the project progresses these concepts will be significantly refined. Real life at the project varies widely from the schedule and will do so in the future. Nonetheless, the activity of all sectors involved in building the plant aims at achieving the most important objectives contained in the schedule.

If we acknowledge that many objectives contained in the schedule are not realized, can we conclude that modeling has not really been introduced? It seems to us that this is wrong. Such a conclusion would be wrong even if calculations using the model were to stop after the schedule had been written. In practice calculations are made on the basis of refined data and therefore, although the new calculations differ from many of the concepts adopted earlier, we believe that the schedule is a vital, living document.

A completely different problem arises in connection with improving the whole system of organizing the construction sector and its work in order to improve its balance. Specifically, it is essential to enhance the ability to maneuver with many resources. Dozens of co-performers participate in building a project: planners, subcontracting construction-installation and special organizations, and construction element and equipment suppliers. A discrepancy or breakdown in the construction schedule for the project by just one of them often significantly worsens the working conditions of many others, and they almost never have reserve capacities with which to maneuver. This makes it necessary, in order to effectively plan production using mathematical economic models, to compose plans of work for all participants in the production process not only at the project under review but in general for their work programs. At the present time this is unrealistic.

Modeling is usually employed at the level of the provisionally closed systems of general contracting trusts. In those cases where it covers a construction association in full, as for example at Glavkrasnoyarskstroy, it is also possible to plan the work of the internal subcontracting organizations of the main administration and the capacities of its building elements enterprises. But the systems of many subcontracting organizations, in particular those of the USSR Ministry of Installation and Special Construction Work, remain unclosed.

Thus, the basic conclusion that can be drawn is that the creation of control models designed for actual control is a complex, multistage process in which the development of a mathematical model is one of the initial stages. Mixed collectives consisting of specialists from various fields, including some of the specialists for whom the model is being created, should be involved in making up the control models.

So let us demand from mathematical economic modeling methods that which they can already provide and work to see that they give as much as possible.

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REVIEW OF SUCCESS OF BELORUSSIAN AUTOMATED SYSTEM FOR PLANNING CALCULATIONS

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 3, Mar 81 pp 41-43

[Article by N. Trubilko, candidate of economic sciences and deputy director of NIIEMP: "The Automated System for Planning Calculations of Belorussian SSR Gosplan"]

> [Text] It is well-known that the first phase of the ASPR [Automated System for Planning Calculations] of Belorussian SSR Gosplan has been in operation for several years. NIIEMP [Scientific Research Institute of Economics and Methodology of Planning] of Belorussian SSR Gosplan participated in development of this system. What are the positive and negative features that have come out during the use of the system? What stage is development of the second phase in? What role is the ASPR given in improving the management mechanism? The editors took these questions to candidate of economic sciences N. Trubilko, deputy director of NIIEMP. We publish his article below.

Our experience with development and operation of the first phase of the ASPR revealed a number of both methodological and organizational shortcomings: a problem-oriented, not integrated approach to planning the elements of the ASPR; independent planning of support equipment for each subsystem; time delays, especially for information support and hardware; differences in the hardware; failure to resolve certain questions of interaction between the ASPR and the sectorial automated control systems of the ministries and departments; and, inadequate development of the methodological issues of planning the system. As a result, the efficiency of the first phase of the ASPR was lower than expected. For example, the computers could not read some of the 108 problems turned over for industrial operation and adjustments had to be made to use them.

According to the coordination plan of jobs ratified by the Main Computer Center of USSR Gosplan, the planning of the first stage of the second phase of the ASPR of Belorussian SSR Gosplan was done for 14 functional and five support subsystems. A total of 203 problems were turned over for industrial use. They were, according to subsystem: composite national economic plan — 5; capital investments — 21;

labor and personnel — 3; science and technology — 5; industrial summary — 7; agriculture — 45; forestry — 26; timber industry — 18; trade — 35; domestic services — 23; construction — 9; building materials — 4; motor vehicle transportation — 2; material-technical supply — 1.

Among all the problems being turned over for use in the first stage of the second phase of the ASPR, the functional subsystems for which the republic is the head organization in the country are considered paramount. The problems in these subsystems account for 60 percent of all the problems in the first stage of the second phase. By stages of planning the problems of the first stage of the second phase of the ASPR are distributed as follows: long-range plan — 29 problems; five-year plan — 61 problems; annual plan — 113 problems. Based on the methodology of solving them, the problems are distributed as follows: optimization problems — 19; forecasting problems — 61; and, direct planning calculations — 123 problems.

Software and hardware means were developed or incorporated for system realization of the sets and problems of the functional subsystems. The information base used 71 classifiers of technical-economic information and ASPR objects. For the software sets of forecasting problems, standard programs to read numerical documents from magnetic tape and form a document file of standardized forms on magnetic disks, the YeS [Unified System] Schet [Count] software system, a system to arrange and print tables of random structure, and the "Dokument" data feeding system are to be used. The hardware is the equipment for preparing and storing data in the "Dokument" system and the technology for performing calculations on YeS computers in solving the ASPR problems of Belorussian SSR Gosplan.

The key area of work by the institute in the 11th Five-Year Plan is completing development of the ASPR and introducing it in order to provide development of alternative plans and optimization of basic plan decisions. Another matter of concern will be improving the efficiency of the system, chiefly through integration of developments, better interaction with the sectorial automated control systems of the ministries and departments, enhancing the role of composite, composite-resource, and intersectorial plan calculations, raising the level of alternatives and balance in planning calculations, and developing high-level system-wide support means for the functioning of the ASPR. Solving these problems will lead to an improvement in the methodological, organizational, and technological foundations of the development of national economic plans of economic and social development.

The republic Gosplan and our institute have recently adopted definite decisions on many questions of the design and introduction of the ASPR. Here are the most important ones.

The designing of the ASPR in the 11th Five-Year Plan should be done together by all the ministries and departments of the republic with subdivisions of Gosplan and NIIEMP. The functional subsystems of the second phase of the ASPR envision 31 subsystems, as compared to 14 in the 10th Five-Year Plan.

The work of the institute will include all composite, composite-resource, and composite-functional subsystems and about one-third of the work on sectorial functional subsystems. The work of the ministries and departments should include six blocks: production (primary activity); capital construction and capital investment; introduction of scientific and technical advances; material-technical supply; financial indicators, prime cost, and profit; and, environmental protection.

The designing and introduction of the second phase of the ASPR is limited to the stage of drafting the annual plan. All drafting work should be completed in 1983, so that in 1984 an automatic calculation of the draft annual plan of economic and social development of the republic can be made for 1985.

The total volume of work on the ASPR in the three-year period will be more than 350 problems, not counting work that will be done by the ministries and departments.

The most extensive sectorial functional subsystems will be those of agriculture (52 problems), transportation (18), housing and municipal services (18), forestry (11), education and culture (11), and light industry (13 problems). All the other systems have less than 10 problems. Many of them have 1-3 problems. It should be noted that the economic subdivisions are expected to finish their work in 1982 in order to have time to complete development of the software.

The ASPR makes high demands for the level of system-wide support means, above all, as I have already mentioned, of the methodological, information, and technological, mathematical, and technical support. Unfortunately, at this time we have practically no such means. A great deal of work must be done to design and introduce them in practice. For example, we must organize work to compile a unified list of indicator descriptions and single out those that are basic to system-wide information resources; insure the introduction of nationwide classifiers to solve problems of the second phase and work out a set of local classifiers for elements of the indicator descriptions that are not covered by nationwide classifiers; work to improve the standardized forms of documents using coding (and decoding) of the indicators of the nationwide and local classifiers; work out the questions of information compatibility between the ASPR and the interacting automated control systems and the Automated System of State Statistics and formulate a set of interdepartmental classifiers and nomenclatures; insure the reliability of data arriving from sectorial automated control systems by automatically matching it against the data of the Automated System of State Statistics and plan indicators in order to work out the composition and structure of the information support for these functions; work out the structure and procedures for collecting and storing systemwide and local data on the basis of interaction among the sectorial automated control systems, the Automated System of State Statistics, and the functional subsystems of the ASPR, providing for the creation of arrays of data of standardized forms of the draft plan from the ministries and departments and arrays of norm-reference data and report and planning information; insure the uniformity of the language by which the user interacts with information resources, including work with videoterminal; work out technical specifications for the formulation of software to support management of systemwide information resources, also including the use of video terminals. The appropriate methodological materials and instructions for solving these problems must be prepared.

Hardware. It is essential, on the basis of the accepted methodology and organization of plan writing to work out and introduce standard and specialized technological processes for debugging and solving economic planning problems in the practical work of Belorussian SSR Gosplan. This requires the following steps: a) work out and introduce technology for collecting, receiving, monitoring, recording, and storing data from ministries and departments (based on standardized draft plan forms), statistical and norm-reference data, planning information, and data from the work positions of employees of Belorussian SSR Gosplan; b) work out and introduce technology for shaping and correcting data, and solve the problem of technological compatibility between the automated data banks of the ASPR and the sectorial automated control systems of the ministries and departments; c) work out technological diagrams for solving sets of problems of the second phase of the ASPR that insure minimum expenditures of time and resources for data processing; d) develop recommendations based on the nature of integration of specific second-phase planning problems, the dimensionality and techniques of solution, and the wisdom of using the batch processing or diaglog modes and work out appropriate technology for solving problems in these modes; e) devise technology for delivering the results of problem-solving to users; f) work out technology for debugging programs and organizing operational correction of raw data stored in the storage units of the computers during the process of solving the economic planning problems of the ASPR subsystems in the dialog mode using video terminals; g) adapt the technological processes of data exchange between computer centers using machine media; h) work out and introduce a technology for using minicomputers in the process of performing calculations on problems of the second phase of the ASPR.

It will also be necessary to establish personnel, structural-organizational, and legal support and support for managing the process of developing state plans.

Now a few words about preplanning economic research. In conformity with the national economic plan of scientific research for 1981-1985 our institute has been named head organization for working out the Plan for Development and Siting of the Productive Forces of the Belorussian SSR for the Period until the Year 2000. This plan is being developed as part of the Master Plan for Siting of the Productive Forces of the USSR by the country's ministries, departments, and scientific research and planning institutes. The Plan is to be developed in several stages. In the first stage (1981), the conception of the basic directions of development and siting of the productive forces of the Belorussian SSR is to be defined. In the second stage (1982), the basic directions and parameters of economic and social development and the siting of the productive forces of the republic are to be substantiated, different alternatives for specialization and comprehensive development of the economy and alternatives for internal siting and territorial organization of productive forces will be worked out, and on this basis an estimate will be made of the basic indicators of the republic's economic and social development for the planning period. In the third stage (1983) the final version of the Plan is to be worked out. In the fourth stage (1984), proposals are to be developed for the economic and social development of the Belorussian SSR in 1986-1995 will be worked out on the basis of the Plan. In the fifth stage (1986) the Plan will be refined in conformity with ratified basic directions, control figures, and the five-year plan.

At the same time our institute will participate in development of the long-term integrated program for development of USSR transportation, the program "Formation of Highly Specialized Industry for the Production of Output for General Machine Building Use," the regional settlement plan, and other preplanning studies.

The Automated System of Planning Calculations of the Belorussian SSR Gosplan will greatly improve the scientific substantiation of decisions that are made, enhance plan balance, and insure operational development of plans. The ASPR will also reduce the labor-intensiveness of plan development.

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COMPUTER CENTER OF CASPIAN STEAMSHIP LINE WORKING WELL

Moscow MORSKOY FLOT in Russian No 4, Apr 81 p 17

[Article by E. Fel'dman: "Electronics Assists the Caspian Steamship Line"]

[Text] The room that houses one of the departments of the computer center of the Caspian Steamship Line is filled with a constant hum and the clicking of calculators. Punched cards are sorted here. N. Volodina and V. Stoyko total the cards on tabulators. The young women do the work quickly, as if playing.

With all respect for the work they are doing, it must be said that their job is gradually becoming outdated. This was the department with which the computer center began. But at that time, in 1951, it had a different name — machine accounting station. Today the accounting work is done by computers.

The room of the group which prepares data for the computer is quiet. Operators L. Maksimova and I. Dzhafarova, sitting at consoles, type the raw data on the keyboard and it is immediately shown on the display screen. The two new systems that prepare data for the computers have already taken half the load off the punching and calculating equipment. Moreover, the process is continuing. Reliability, trouble-free operation, and simple control are the main qualities of the new equipment that the operators are using.

The computer center today solves a broad range of problems, 35 in all, but its chief work is processing the trip reports of the captains with complete analysis of ship downtime and outputting of all essential statistical report data. In essence, all the industrial enterprises, the port of Baku, and other organizations of the steamship line call on the computer center for help in solving complex management and accounting problems.

The system for maintaining a continuous schedule-plan of fleet work recently went into operation. It makes it possible to determine the workload of Caspian ports and compile a schedule of ship arrival for processing on an operational basis and, most important, at the right time. Specialists A. Yatsenko and Ye. Golubeva deserve major credit for the introduction of this system.

The direct annual economic benefit from introducing problems to raise the traffic capacity of the fleet is 207,000 rubles, with an additional savings of

257,000 rubles thanks to improving the quality of labor and reducing the labor-intensiveness of management.

The growing requirements for quality of management, the updating of the fleet of the steamship line with modern, automated ships that is to take place in the 11th Five-Year Plan, and the significant increase in number of ferries also give the computer center new tasks.

"In the near future," says the chief of the center V. Shafir, "we are going to establish direct communication between the steamship line's dispatching office and the computer center by means of external displays installed at the shipping and fleet traffic service. This will make it possible to determine the position of the ships exactly on an operational basis, improve the reliability of information, and ultimately increase the efficiency of the work."

It is also important to solve this problem as quickly as possible because, given the intensive navigation on the Caspian with very short ship turnaround, the positions of ships can change significantly even in an hour, and the electronic computer equipment will help make the appropriate corrections. For example, it will help reduce or eliminate empty runs.

In April 1981 the collective of the computer center will celebrate its 20th anniversary. The employees of the center are also young. The average age is about 30. Contests among new operators, which have become a tradition here already, will help improve their professional skills.

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BRIEFS

COMPUTER MONITORING OF POWER STATION--Voronezh (TASS)--Electronics have assumed continuous monitoring of the operation of the major units of the Voronezh power system. At the Voronezhenergo load dispatching center, the country's first teleinformation complex based on the Elektronika-60 computer has been put into operation. The complex monitors power generation by the atomic and thermal stations, the load on high voltage lines and other system parameters. Any deviation from the norm is recorded on a special device and the malfunctioning section is instantaneously disconnected. When needed, the dispatcher can display on a screen the status of the electrical equipment or the substation circuit in which the disruption occurred, and expeditiously analyze the situation. The teleinformation complex significantly raises the reliability and efficiency of the dispatcher's control of the power system. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Apr 81 p 2] 8545

CSO: 1863/163

EXHIBITIONS

UPCOMING EXHIBITION ON COMMUNICATIONS SYSTEMS

[Editorial Report] Moscow SPUTNIK in English No 5, May 81 p 143. The third international exhibition "Communication Systems and Equipment" will be held 2-16 September 1981 in Moscow.

Additional information can be obtained from: V/O Expocentre, USSR Chamber of Commerce and Industry, 1a ul. Sokol'nicheskiy Val, Moscow 107113. Telex: 411185, 411948 EXPO SU. Telephone: 2685874.

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PUBLICATIONS

ABSTRACTS FROM THE JOURNAL 'CONTROL SYSTEMS AND MACHINES', MARCH-APRIL 1981

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 2, Mar-Apr 81
pp 145, 147, 149, 151

UDC 681.326.3

ESTABLISHING PRODUCTION STANDARDS IN THE ETAP-1 ORGANIZATIONAL SOFTWARE PACKAGE

[Abstract of article by Yefetova, K. F., Strekalov, A. F., Khazanov, I. B., and Shkurba, V. V.]

[Text] This article reviews a package of programs for forming standards at enterprises with experimental production under conditions of information uncertainty. The basic schemes for setting up a library of output standards and standards of technological systems at the level of future and annual planning at a science-production association are given. The article has two illsutrations and two bibliographic entries.

UDC 62-52:681:31

SOME QUESTIONS OF CONSTRUCTING INTEGRATED SYSTEMS TO CONTROL INDUSTRIAL ENTERPRISES

[Abstract of article by Kuntsevich, V. M. and Dolya, V. I.]

[Text] This article reviews some comparative features of the construction of integrated control systems for industrial enterprises with continuous and discrete production. The article has one illustration and 18 bibliographic entries.

UDC 338.984

BASIC REQUIREMENTS FOR PLANNING MODELS AT THE LEVEL OF THE REPUBLIC GOSPLAN

[Abstract of article by Arkhangel'skiy, Yu. S.]

[Text] The article considers five requirements for planning models. Following these requirements will promote the introduction of such models in the practical work of republic state planning committees and replacement of manual calculations. The article has two bibliographic entries.

UDC 338.984+681.31

ONE METHOD OF SOLVING THE PROBLEM OF OPTIMAL DISTRIBUTION OF THE PRODUCTION PROGRAM OVER PLANNING PERIODS

[Abstract of article by Britavskiy, G. M., and Beygel'zimer, M. G.]

[Text] This article formulates the problem of optimal (rational) distribution of the quarterly plan of a machine building plant by months. To solve the problem the quantized function of the expenditures of possible alternatives of plan distribution is determined and dynamic programming procedures are used to find the optimal (rational) distribution. An example that illustrates the problem-solving algorithm is given. The article has three illustrations, four tables, and six bibliographic entries.

UDC 338.984

THE USE OF FORECAST ESTIMATES IN FUTURE PLANNING MODELS

[Abstract of article by Yakovleva, V. S.]

[Text] This article reviews the problem of constructing a future planning model in three steps: forecast; program; plan. The model makes it possible to develop future plans for the subdivisions of a science-production association by insuring the compatibility of forecasted developments and the future programs and critical path models compiled on their basis. The article has one illustration and seven bibliographic entries.

UDC 681.332.3

DECISION-MAKING TECHNIQUE BASED ON RETROSPECTIVE ANALYSIS

[Abstract of article by Androsenko, S. G., Morozov, A. A., and Timofeyev, A. B.]

[Text] This article considers the further development of the retrospective analysis technique, which makes it possible to improve the reliability of information being received. There is a comparative analysis of the probabilities of uncorrectable and undetected errors using the traditional technique and the proposed technique. The article has one table and three bibliographic entries.

UDC 681.31

NEW ASPECTS OF THE APPROACH TO SOLVING CERTAIN PROBLEMS OF COMPUTER TECHNOLOGY UNDER CONTEMPORARY CONDITIONS

[Abstract of article by Bryukhovich, Ye. I.]

[Text] This article reviews the evolution of the value of the criterion of minimum hardware expenditures in different generations of computers. It is demonstrated that under contemporary conditions the amount of hardware expenditures is no longer an obstacle to the use of the potential capabilities of positional notation to solve the problems of automatic monitoring, high speed, and power consumption. The article has 11 bibliographic entries.

UDC 681.3.053

CONSTRUCTION OF SEQUENTIAL MULTIPLIERS WITH MINIMUM MACHINE CYCLES ON DYNAMIC REGISTERS

[Abstract of article by Tarasenko, V. P., and Toroshanko, Ya. I.]

[Text] This article sets forth the principles of constructing sequential-type multipliers with a constant machine cycle that corresponds to the bit configuration of the numbers being processed. The possibility of multiplication in an n-phase machine cycle and an abbreviated (n-phase) cycle is discussed, with examples of constructing such devices with different machine cycles. The article has three illustrations, one table, and four bibliographic entries.

UDC 681.32

ANALYSIS OF THE EFFECT OF HARDWARE CONFLICTS ON THE PRODUCTIVITY OF MULTIPROCESSOR SYSTEMS

[Abstract of article by Boguslavskiy, L. B., and Krenin, A. Ya.]

[Text] This article analyzes the effect of the composition of different modules and units of a multiprocessor system and the principles of interlinking modules on system productivity. The authors consider models of systems with fully connected and double-connected interfaces between the processors and memory and systems with singly connected interfaces and local memory blocks in the processors. The article has seven illustrations and nine bibliographic entries.

UDC 681.327.63

LAYERING MEMORY FOR A MICROPROGRAM CONTROL UNIT OF A MULTIPROCESSOR

[Abstract of article by Vilenkin, S. Ya., Nabatov, A. S., and Pivovarov, G. Yu.]

[Text] This article considers characteristics of layering the microprogram memory of a multiprocessor and productivity losses where this is done. The authors suggest ways to reduce the losses and methods of evaluating the efficiency of these means. The article has four illustrations, one table, and three bibliographic entries.

UDC 681.3.025

THE USE OF ORDERED CHOICE FUNCTIONS TO IMPROVE THE RELIABILITY OF DIGITAL CONTROL COMPUTERS

[Abstract of article by Spiridonov, V. I.]

[Text] This article considers the method of majority redundancy applied to digital units with multivalued output in the form of a binary number of random bit configuration. For practical use of the method a restoring element is developed that realizes the ordered choice function of binary number variables. The questions of selecting the optimal form of this function are resolved. The article illustrations and five bibliographic entries.

UDC 519.21+681.32

PROBABLISTIC MODELING OF MALFUNCTIONS IN DISCRETE OBJECTS

[Abstract of article by Liokumovich, B. Ye.]

[Text] This article considers the problem of simulating a random stream of malfunctions and failures in logical models of discrete objects. The authors propose parameters to characterize the malfunctioning of elements, software and a procedure for determining the value of parameters in the model of the object, and a structural diagram for simulating malfunctions. The article gives a short description of a program that performs this task. The article has one illustration and six bibliographic entries.

UDC 681.327

REPRESENTATION OF STRAIGHT LINES ON A TELEVISION SCREEN BY BASE SEGMENTS

[Abstract of article by Agapov, V. S., and Prishchenko, V. A.]

[Text] This article considers a method for representing segments of straight lines on a television screen. The method is based on conditional division of the screen into fixed character-places, representing line segments within these places by means of a limited number of base segments, and using a limited number of standard sequential shifts of the base segments. As a result it is possible to approximate any straight line by base segments to a precision of one resolution element within the limits of the screen. The article has two illustrations and four bibliographic entries.

UDC 681.3:51

USE OF A PROBLEM-ORIENTED AUTOMATED HYBRID COMPUTING SYSTEM TO SOLVE PROBLEMS OF HYDRODYNAMICS

[Abstract of article by Rabedzhanov, N. R., Sattarov, M. A., and Kuknariyev, R. D.]

[Text] This article considers the questions of building a problem-oriented automated hybrid computer system. The authors propose modular organization of the structure of the analog part of this system and multistage commutation based on the use of a specially developed automatic set-up device. The article has four illustrations and seven bibliographic entries.

UDC 681.322

AUTOMATED SYSTEM FOR MONITORING AND IDENTIFYING MALFUNCTIONS

[Abstract of article by Blokhin, V. N., Vorob'yeva, L. I., Golovanevskiy, G. L., Nemolochnov, O. F., and Khramtsov, Yu. V.]

[Text] This article considers the principles of organization, distinctive features, and operating characteristics of an automated system to monitor and diagnose malfunctions in standard replacement elements with integrated microcircuits as a subsystem of the integrated automated design system based on the YeS computers. The article has one illustration, two tables, and six bibliographic entries.

UDC 681.327.1

THE MICROAUTOMOTON — A NEW ELEMENT FOR COMPUTER TECHNOLOGY

[Abstract of article by Derkach, V. P., Korsunskiy, V. M., and Khachatrian, V. B.]

[Text] This article considers large integrated circuits that perform the functions of a digital automoton whose table of transfers and outputs can be programmed. The authors substantiate the structure and rational nomenclature of such large integrated circuits (microautomotons) to make it possible to construct intricate automatic systems. Examples of control algorithms are given. The article has four illustrations, two tables, and 17 bibliographic entries.

UDC 681.3.053

AUTOMATION OF THE STRUCTURAL DESIGN OF FAST FOURIER TRANSFORM PROCESSORS

[Abstract of article by Rovenskiy, V. M.]

[Text] The author demonstrates that the problem of automating the structural design of fast Fourier transform processors today can be reduced to the problem of obtaining sufficiently simple analytical expressions. The article obtains these expressions (or shows how they can be obtained) and describes a possible algorithm for automating the structural design of fast Fourier processors. The article has two illustrations and nine bibliographic entries.

UDC 681.3.06

SOME PRINCIPLES OF DESIGNING A SPECIAL SOFTWARE INFORMATION OPTIMIZATION SYSTEM

[Abstract of article by Babich, M. D., Ivanov, V. V., and Shevchuk, L. B.]

[Text] This article reviews the basic principles of constructing a special software information optimization system and the composition, structure, and functional capabilities of this system. The information optimization system, as a supplement to the human being-computer system, is expected to provide information reference service, make it easier for the user to handle libraries and program resources, and support the writing of large programs for solving complex problems by an assigned criterion. The article has one illustration and nine bibliographic entries.

UDC 62-52:681.3.01

AUTOMATED SUBSYSTEM FOR COLLECTING AND ANALYZING DATA ON THE QUALITY OF DATA PROCESSING IN AN AUTOMATED CONTROL SYSTEM

[Abstract of article by Asherov, A. G., and Kozhevnikov, G. K.]

[Text] This article describes the composition of the software and data base of an automated subsystem to collect and analyze data on the quality of data processing in an automated control system. The software and information base provides simplicity and convenience of work with the system and makes it possible to adapt the subsystem easily to the conditions of the particular application. The article has seven bibliographic entries.

UDC 681.3.053

INCREASING THE PRECISION OF DATA PROCESSING ON YeS COMPUTERS

[Abstract of article by Il'yenko, B. A., and Dorokhina, N. D.]

[Text] This article considers the formation of systematic error when feeding data to YeS computers occurring because the data are not rounded at certain stages of their conversion. The authors propose changes in the appropriate programs to improve the precision of data feeding and the results of its subsequent computer processing. The article has two illustrations and three tables.

UDC 62-52:681.3.06

IMPROVING THE EFFICIENCY OF PROGRAMMING PROBLEMS FOR AUTOMATED CONTROL SYSTEMS FOR INDUSTRIAL PROCESSES IN SMALL-SERIES PRODUCTION

[Abstract of article by Andriyanov, V. A., Gringauz, A. D., and Bukin, A. Ye.]

[Text] This article considers an automated control system to program control processes that is oriented to operational development of industrial control programs for minicomputers and microcomputers. The system has been set up with YeS computers and is accessible to a broad range of technological specialists. The raw data for the system are assigned in the form of solution tables. The article has two illustrations and six bibliographic entries.

UDC 681.3.06

INTEGRATED PROGRAM DEBUGGING IN THE LYAPAS-M LANGUAGE

[Abstract of article by Toropov, N. R.]

[Text] The author sets forth the principles of constructing a dialog monitor which provides programmers with convenient means for integrated semantic debugging of multimodule programs directly in LYAPAS-M. The article has three bibliographic entries.

UDC 681.327.1

MULTIPURPOSE PROGRAMMED REMOTE PROCESSOR FOR USER STATIONS OF COLLECTIVE-USE COMPUTER CENTER

[Abstract of article by Doriy, Ya. P.]

[Text] This article reviews the structure and functions of a multipurpose programmed remote processor for the user station of a collective-use computer center where the station uses an SM-3 or SM-4 minicomputer. The author proposes a set of local commands to manage the work and carry on user dialog with the user station. The article has two illustrations and five bibliographic entries.

UDC 62-52:681.3.053

THE IMPACT OF REORGANIZATION OF THE DATA BASE ON THE RESPONSE TIME OF AN INFORMATION SYSTEM

[Abstract of article by Litvin, V. G., and Lysyakov, P. K.]

[Text] This article describes the effect of competitive reorganization of a data base on the response time of the information system. The authors review cases of quick and slow reorganization and the case of transferring a data base with an assigned frequency to reorganization. The article has five illustrations, one table, and seven bibliographic entries.

UDC 681.3.053

ONE APPROACH TO DESIGNING THE SOFTWARE OF AUTOMATED SYSTEMS TO PROCESS TEST RESULTS

[Abstract of article by Val'kman, Yu. R., Kvachev, V. G., and Nikitin, A. I.]

[Text] This article considers an approach to designing an information subsystem based on analysis of the subject area of the systems for processing test results on complex items of new technology. The authors give some design concepts for setting up the data bases of such automated systems. The article has three illustrations, one table, and 11 bibliographic entries.

UDC 681.3.06

PACKAGE OF APPLIED PROGRAMS FOR PHYSICAL ORGANIZATION OF DATA BASES

[Abstract of article by Ignatenko, B. V., Kolodko, L. I., Pavlovskiy, V. I., and Savchenko, S. F.]

[Text] This article gives a description of a package of applied programs that provides random access to a dynamically changing data domain. Access to any data element is accomplished in a fixed period of time. Nonprocedural means of shaping assignments to define and retrieve data are used to control the data. This package may be used to construct vocabularies, classifiers, libraries of reference-norm information, and the like. The article has two bibliographic entries.

UDC 681.3:658:56

IMPROVING INTRAPLANT PLANNING AT A SHIPBUILDING ENTERPRISE ON THE BASIS OF A MULTILEVEL MODEL

[Abstract of article by Khodorkovskiy, L. M., Genbom, A. V., and Mazykina, N. A.]

[Text] This article sets forth the basic directions of modeling the processes of shipbuilding by formulating a model whose levels are a composite schedule, consolidated schedules of the construction of particular vessels, and standard alternative segments of the manufacture of the design elements of a ship. The model is used for integrated solutions to problems of technical-economic and operational productional planning, dispatcher service, and regulating shipbuilding processes. The article has two illustrations and five bibliographic entries.

UDC 681.3:658.56

PRINCIPLES OF SOLVING THE PROBLEM OF CONTROLLING THE MOVEMENT OF LABOR RESOURCES IN A CITY AUTOMATED CONTROL SYSTEM FOR LABOR

[Abstract of article by Petrov, D. G.]

[Text] This article formulates the problem of controlling the movement of labor resources among enterprises of a city as a problem of controlling the behavior of groups of people. The author suggests a mathematical model for shaping migration flows of labor resources. The principles of automating the job placement process are considered. The article has one illsutration and five bibliographic entries.

UDC 62-50:681.3.06

MODEL OF SOFTWARE FOR AN AUTOMATED SYSTEM TO CONTROL THE INDUSTRIAL PROCESSES OF WEIGHING AND DOSING BULK MATERIALS

[Abstract of article by Ivanov, A. N. and Pozin, S. M.]

[Text] The authors propose a standard model of software for a real-time automated system to control the industrial processes of weighing and dosing bulk materials and ferroalloys in the convertor steel production process. The article has three illustrations and two bibliographic entries.

UDC 62-50:681.3.06

THE INTERACTIVE AND MULTIPROCESS MODES OF SOLVING OPTIMIZATION PROBLEMS IN A NON-DIFFERENTIABLE OPTIMIZATION PACKAGE

[Abstract of article by Loskutov, V. G. and Nosov, A. M.]

[Text] This article investigates an approach to improving the efficiency of interactive optimization systems based on the use of multiple processes. The authors describe the application of this approach to solving nonlinear and stochastic extremal problems. They present specific interactive facilities in a non-differentiable optimization package. The article has six bibliographic entries.

UDC 681.3.06

SYSTEM FOR SETTING UP AND OPERATING A DATA BASE ON M6000 ASVT-M MAGNETIC DISKS

[Abstract of article by Fokin, Yu. A.]

[Text] The author describes an interactive system that expands the functional capabilities of a system to control files in a real-time disk operating system for the M6000 control computer. The article gives a set of new operations on files with random information and entries of fixed and variable length.

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